The Journal of the International College of Surgeons

FOUNDED IN GENEVA, SWITZERLAND, 1935 - INCORPORATED IN WASHINGTON, D C., 19[illegible]0

Editor-in-Chief
MAX THOREK, M.D., Sc.D., LL.D., F.B.C.S., F.I.C.S., F.P.C.S. (Hon.), F.R.S.M.

Associate Editor
PHILIP THOREK, M.D., F.A.C.S., F.I.C.S.

Consulting Editor
MORRIS FISHBEIN, M.D., F.I.C.S. (Hon.)

Assistant Editors
DOROTHY LANGLEY AND PAULA GOLICK

Specialty Editors

Cardiovascular Surgery
Charles P. Bailey, M.D., F.A.C.S., F.I.C.S.
Philadelphia, Pennsylvania

Neurologic Surgery
James W. Watts, M.D., F.A.C.S., F.I.C.S.
Washington, D. C.

Ophthalmologic and Otolaryngologic Surgery
Paul C. Craig, M.D., F.A.C.S., F.I.C.S.
Reading, Pennsylvania

Obstetric and Gynecologic Surgery
J. P. Greenhill, M.D., F.A.C.S., F.I.C.S.
Chicago, Illinois

Orthopedic Surgery
Edward L. Compere, M.D., F.A.C.S., F.I.C.S.
Chicago, Illinois

Plastic and Reconstructive Surgery
Neal Owens, M.D., F.A.C.S., F.I.C.S.
New Orleans, Louisiana

Proctologic Surgery
Harry E. Bacon, M.D., F.A.C.S., F.I.C.S.
Philadelphia, Pennsylvania

Urologic Surgery
Michael K. O'Heeron, M.D., F.I.C.S.
Houston, Texas

Occupational Surgery
Chester C. Guy, M.D., F.A.C.S., F.I.C.S.
Chicago, Illinois

CONTENTS—JANUARY, 1956

ABDOMINAL AND GENERAL SURGERY

Significance of Visualization of Gallbladder in Twenty-Four Hour Roentgen Plate... 1
H. Grady Cook, M.D., F.A.C.S., F.I.C.S., Hattiesburg, Mississippi

Steroid Anesthesia in Man: Clinical and Cerebral Effects 9
Gilbert S. Gordan, M.D., Ph.D., Neri Guadagni, M.D., Joseph Picchi, M.D., and John E. Adams, M.D., with the technical assistance of Edward Martinez, B.S., and Patricia McCreery, M.T., San Francisco, California

Steroid Anesthesia in Man: A Clinical Report 13
Frank J. Murphy, M.D., Neri Guadagni, M.D., and Francis L. DeBon, M.D., San Francisco, California

CARDIOVASCULAR SURGERY

Intra-Arterial and Subcutaneous Oxygen in the Treatment of Peripheral Arterial Disturbances 18
Fritz Judmaier, M.D., Innsbruck, Austria, and Herbert A. Roedling, M.D. Milwaukee, Wisconsin

Surgical Approach ~~to the~~ Aortic Valve in the Dog.................. 26
tela, M.D., Enzo de Cesare, M.D., and Ferdinando Lanutti, M.D.,
y

rience in the Surgical Repair of Experimentally Produced Atrial Septal
se of a New Instrument.. 30
tela, M.D., Rome, Italy

RY

cing in the Treatment of Cerebral Spastic Paralysis of the Extremities 35
ats, M.D., F.I.C.S., D.A.B., Orange, New Jersey

YNECOLOGIC SURGERY

Obstetrics and Gynecology in Relation to Infection of the Urinary Tract 40
Douglas, M.D., F.A.C.S., F.I.C.S., D.A.B., George C. Douglas, B.S., M.D.,
. Douglas, B.S., M.S., M.D., Gilbert F. Douglas, Jr., B.S., M.D., Sarah
ouglas, B.S., B.A., M.S., M.T., Birmingham, Alabama

Fetal Wastage: The Obstetrician's Point of View.................. 53
. Glasser, M.D., Radcliffe, New Jersey

AND OTOLARYNGOLOGIC SURGERY

f Orthoptics.. 65
. Spaeth, M.D., F.A.C.S., F.I.C.S., D.A.B., Philadelphia, Pennsylvania

ntraocular Acrylic Lens Operation: Comments and Modifications...... 72
Perritt, M.D., F.I.C.S., D.A.B., Chicago, Illinois

RY

Lateral Rotation of Legs in Small Children........................ 77
Kite, M.D., F.A.C.S., Atlanta, Georgia

the Leg: Clinical Use of Alloplastic Bone Graft 85
Lichtor, M.D., F.I.C.S., D.A.B., and Joseph Lichtor, M.D., A.I.C.S.,
y, Missouri

NSTRUCTIVE SURGERY

d Preparation of Plastics...................................... 91
Cobey, M.D., F.A.C.S., Washington, D. C.

Plastic Surgery in Industry.................................... 96
Straith, M.D., D.D.S., F.A.C.S., F.I.C.S., D.A.B., Detroit, Michigan

ERY

ndoscopic Examination of the Colon 104
Jackson, M.D., and Malcolm R. Hill, M.D., F.A.C.S., F.I.C.S., D.A.B.,
es, California

f the Injection Treatment of Hemorrhoids 112
Rilling, M.D., F.A.C.S., F.I.C.S., D.A.B., Philadelphia, Pennsylvania

Ureters and Urinary Bladder from Renal Carcinoma:
Two Cases.. 117
S. Abeshouse, M.D., F.A.C.S., F.I.C.S., D.A.B., Baltimore, Maryland

f One-Stage Resections of Esophageal Diverticula 127
W. McNealy, F.A.C.S., F.I.C.S. (Hon.), D.A.B., Chicago, Illinois

.... 130

CURRENT LITERATURE.. 134

COLLÈGE INTERNATIONAL DES CHIRURGIENS
GENÈVE 35

FOUNDED BY DR. MAX THOREK

The Journal of the
International College of Surgeons

FOUNDED IN GENEVA, SWITZERLAND, 1935 - INCORPORATED IN WASHINGTON, D. C., 1940

Vol. XXV JANUARY, 1956 No. 1

Abdominal and General Surgery

Significance of Visualization of Gallbladder in Twenty-Four Hour Roentgen Plate

H. GRADY COOK, M.D., F.A.C.S., F.I.C.S.
HATTIESBURG, MISSISSIPPI

IN presenting a series of cases of any condition it is always of some interest and value to review briefly the history of the subject, and this is especially applicable to radiologic study of the gallbladder.

In 1897, Buxbaum (Vienna) demonstrated *stones in 4 of 30 patients examined*. In 1900, Beck in the United States, was able to demonstrate stones in 2 cases. About 1910, Shurmayer and others directed attention to the so-called indirect radiologic signs of cholecystic disease, as follows:

1. Fixation, displacement and/or deformity of the duodenal bulb, pylorus and/or hepatic flexure of the colon, presumed to be due to pericholecystic adhesions.
2. *The shadow of the gallbladder pro*duced by abnormal thickness of its walls or the deposit of calcium therein.

In 1922, Dr. Evarts A. Graham had temporarily discontinued the practice of medicine to study chemistry. He was working with the chlorinated phenolphth-

---

From the South Mississippi Infirmary and Clinic, Hattiesburg.

Submitted for publication July 21, 1955.

aleins, and it occurred to him that, since Abel and Rountree had demonstrated that chlorinated phenolphthaleins are excreted almost entirely through the bile, "it might be possible to substitute for the chlorine atom something which would prove opaque to x-ray and therefore cast a shadow of the gallbladder."

He then administered the sodium salt of tetraiodophenolphthalein intravenously to 6 dogs. A shadow of the gallbladder was obtained in only 1 of the 6. Seeking the answer to this, he discovered that the keeper of the dogs had neglected to feed the dog in which visualization occurred, while the other 5 dogs had been given breakfast as usual. "Greater efficiency on the part of the animal keeper," he commented,[1] "would doubtless have resulted in complete failure of our experiment and therefore we would have given up the whole idea. Sometimes efficiency can be a curse."

Graham continued his study with the aid of Cole and later Copher, seeking to find a less toxic compound. The bromide salt was substituted for the iodide, and the first human subject was a Negress in Barnes hospital with a typical history of gallstone colic. Films of this patient before injection of dye showed no stones. After injection of the dye no shadow was obtained of either gallbladder or stones; nevertheless, at operation numerous stones were observed. This was very disappointing to the investigators until it occurred to them that, in all probability, either the diseased gallbladder was unable to concentrate the dye sufficiently to cast a shadow or the common duct was obstructed. They then realized that they probably had discovered a functional test for disease of the gallbladder. They deduced that good visualization of the gallbladder depends on the following factors:

1. A sufficient amount of the dye must enter the blood stream.
2. It must be excreted by the liver into the bile in sufficient amount.
3. It must get into the gallbladder.
4. The gallbladder must be nearly enough normal to concentrate its contents by the adequate absorption of water from the same.

With the help of the Mallinckrodt Chemical Works, these workers developed an isometric compound which could be administered orally, i. e., phenoltetraiodophthalein. This was widely used orally and intravenously until, in 1940, priodax (alpha-phenylpropionic acid) was first produced by Dohrut Diedrich in Germany under the name of "biliselectin." This compound had the advantages of being less toxic, casting clearer shadows and being almost completely absorbed in the small intestine, eliminating confusing shadows of dye in the large bowel.

Recently a new dye, telepaque, has to a considerable extent replaced priodax. In

TABLE 1.—*Symptoms and Signs*

Symptom or sign	*Number of Operative Cases*	*Percentage of Operative Cases*	*Number of Nonoperative Cases*	*Percentage of Nonoperative Cases*
Pain (right subcostal or epigastric)	15	93.7	53	74.6
Tenderness (right subcostal)	15	93.7	53	74.6
Eructation	16	100	63	87.7
Nausea	15	93.7	54	76
Intolerance to fat	11	68.7	52	73.2
Vomiting	8	50	21	29.5
Nervousness	9	56.2	49	67.6
Constipation	16	100	62	87.3
Obesity	9	56.2	21	29.5
Acute attacks of cholecystitis	13	81.4	23	32.3
More than one acute attack	8	50	18	25.4
Stone visualized	3	18.3	4	5.6
Total	16		71	

Sosman's opinion it has the following advantages:

1. Less nausea and diarrhea and other effects.
2. A greater percentage of gallbladders can be visualized telepaque, 4 per cent not visualized; priodax, 12 per cent not visualized; telepaque, 24 per cent of functioning gallbladders showed stones or polyps and 20 per cent of all gallbladder series showed stones or polyps.
3. The cystic hepatic and common bile ducts are much more frequently visualized.

Shehadi stated that with telepaque the normal gallbladder was observed to respond promptly to a fat meal, contracting to one-fourth of its original size or less in forty minutes.

Mann draws the following hypothesis for the function of the gallbladder: "During fasting the liver produces small amounts of bile, most of which is stored and concentrated in the gallbladder. After a meal acid chyme enters the duodenum and causes the sphincter of Oddi at the ampulla of Vater to relax and the gallbladder to expel its bile. Bile is rapidly absorbed and stimulates the liver to excrete more bile. During the process of digestion there is active flow of bile to and from the gallbladder. This occurs as long as acid chyme flows into the duodenum. In the fasting state most of the bile is stored in the gallbladder by concentration."

Baydew, an anatomist at Harvard, demonstrated in 1922 that complete collapse of the mammal gallbladder could be induced naturally by administration of appropriate food—cream and egg yolk. Olin in 1934 stated, with regard to the physiologic aspects of cholecystography, "The dye salt is eventually excreted by the liver and by the gallbladder. During the passage through these organs, similar to the passage of barium sulfate in gastro-intestinal studies, a shadow will be produced in the x-ray film. The concentration of the gallbladder contents, due to the absorption of water, is primarily responsible for the intense dye shadow which is cast."

From these conceptions it seems not unreasonable to suppose that if the gallbladder wall is diseased or the function of the ducts or their sphincters is disturbed by pathologic processes, this may interfere with the emptying of the gallbladder, so that a shadow remains for a longer period than is normal.

From a search of the literature it appears to be generally agreed that:

1. Given a technically correct examination, failure to visualize the gallbladder indicates a nonfunctioning diseased gallbladder. Sosman stated that this observation is 99 per cent accurate.
2. If a gallbladder contracts normally, showing at least a 50 per cent decrease in size within one to two hours after a fatty meal, this response can be considered an added index of normality.
3. The presence of stones indicates a pathologic condition, if not necessarily poor function.

If a gallbladder fails to contract after a fatty meal, however, Sosman's opinion is that this fact has but doubtful value in diagnosis. Rigler, on the other hand, stated that failure to empty indicates poor function of the gallbladder or valvular obstruction at its neck. These are simply examples of the disagreement that exists as to the significance of the importance of complete emptying of the gallbladder after a fatty meal.

When I first came to this Clinic in 1930, Dr. W. W. Crawford and his associate, Dr. F. D. Bower, considered a gallbladder pathologic if it could still be visualized in the so-called twenty-four hour plate (thirty-nine or more hours after ingestion of the dye). Later I came into contact with many radiologists and surgeons who con-

TABLE 2.—*Results of Medical Treatment*

Operative cases No. 16	*Number*	*Percentage*
Previous major surgery	10	62.5
Good results	0	0
Fair results	0	0
Poor results	16	100
Nonoperative cases No. 71		
Previous major surgery	23	32.3
Good results	37	52.1
Fair results	19	26.9
Poor results	4	5.64

TABLE 3.—*Operative Results*

	Number of Cases	*Percentage*
Operative cases	16	18.3
Good results	12	75
Fair to poor results	3	18.3
Death	1	6.25
Total	87	

sidered "revisualization" of the gallbladder in the twenty-four hour plate of no consequence; in detecting minor degrees of dysfunction, they depended on estimation of the gallbladder's ability to concentrate the dye after the fatty meal. Influenced by these men, I discontinued making the twenty-four hour plate for about two years. I soon found that it was very difficult, if not impossible, to differentiate between normal and abnormal emptying and concentration. For example, variation in roentgen technic between the full film and the two-hour emptying film can make considerable difference in the apparent amount of concentration of the dye, and the size of the gallbladder shadow after the fatty meal, as well as its density, may be influenced greatly by psychic and other factors. Therefore, in 1946, I returned to making the twenty-four hour film and am convinced that use of this film has enabled me to detect low grade symptomatic cholecystitis with greater certainty. Stated briefly, my conviction is that failure of the gallbladder to empty completely (so-called revisualization) thirty-nine or more hours after administration of the dye is indicative of poor function and pathologic change, which may or may not produce clinically apparent symptoms. It was to investigate the correctness or incorrectness of this view that the following study was suggested some months ago by Dr. Andrew Carroll of this Clinic.

The study consists of an analysis of 87 cases in which the gallbladder shadow was

TABLE 4.—*Operative Cases**

	Number	*Percentage*
Gross pathologic change	13	80.1
Microscopic pathologic change	14	87.5
Specimens unsatisfactory	2	12.5
Total Cases	16	

*NOTE: Two specimens were unsatisfactory for microscopic examination. One of these showed marked gross pathologic change. Three specimens were reported as showing "mild chronic cholecystitis."

TABLE 5.—*Gross Pathologic Observations*

1. Adhesions of gallbladder to surrounding structures
2. Stones
3. Enlargement of head of pancreas
4. Fatty degeneration of gallbladder wall
5. "Strawberry" appearance of mucosa
6. Atrophy and stenosis of cystic duct

TABLE 6.—*Microscopic Pathologic Observations (16 Cases)*

1. Chronic cholecystitis	10 cases
2. Leiomyoma of gallbladder and chronic cholecystitis	1 case
3. Chronic cholecystitis and chronic cholelithiasis	2 cases
4. Acute, subacute and chronic cholecystitis	2 cases
5. Cholesterolosis alone	1 case

TABLE 7.—*Primary Reasons for Not Operating*
Total No. of Cases — 71

	Number	*Percentage*
Good results from medical treatment	13	18.3
Other pathologic conditions more urgent	21	29.5
Psychoneurosis	6	8.4
Mild disease or none	18	25.3
Operation refused	10	14.1
Total	71	

TABLE 8.—*Chief Symptoms in Seventy-one Nonoperative Cases*

	Number	*Percentage*
Pain in right upper quadrant or epigastrium	38	53
Nausea	6	8.4
Vomiting	1	1.4
Intolerance to fats	1	1.4
Precardial pain	3	4.2
Other symptoms	49	69
Total	71	

seen in the twenty-four hour plate, i. e., thirty-nine or more hours after oral administration of the dye. Some of the cholecystograms in these cases were done with telepaque and some with priodax.

Of the 87 patients, 16 came to operation and were cholecystectomized. Seventy-one were not operated on.

In analyzing these cases my associates and I were interested in finding out: (1) To what extent definite symptoms and signs of disease of the gallbladder existed; (2) what percentage responded to medical therapy; (3) what percentage came to operation; (4) what percentage revealed definite pathologic change at operation, and (5) what were the clinical results of operation, as nearly as could be judged?

Table 1 lists the physical signs, symptoms and acute attacks usually thought of as associated with cholecystitis and their frequency of occurrence in 87 cases in which the gallbladder dye shadow was visible in the twenty-four hour plate. Table 2 analyzes the results of medical therapy in both operative and nonoperative cases and indicates the number of patients who had previously undergone major surgical procedures. In Table 3 are shown the postoperative results in 16 operative cases; Table 4, the prevalence of gross pathologic change among the patients operated on, and Table 5, that of microscopic pathologic changes in the same patients. Table 6 lists the microscopic pathologic observations in detail. In Table 7 will be found the bases on which it was decided not to operate in 71 cases; in Table 8, the chief clinical symptoms in these cases.

SUMMARY AND CONCLUSIONS

The authors do not expect to draw any definite conclusions from such a small number of cases as that presented in this article. However, in their opinion the study at least indicates that there is a relation between failure of the gallbladder to empty completely in thirty-nine or more hours and pathologic change in this organ or its ducts. In a large majority of their cases this observation was associated with clinical symptoms sufficiently marked to bring the patient to the physician, and, of those operated on, 80 per cent or more showed definite pathologic change in the gallbladder.

Obviously it is easier to determine whether or not the gallbladder is visualized in the twenty-four hour plate than it is to determine the amount of emptying or concentration that has occurred in the two-hour film after a fatty meal.

Frequently the pathologic condition is mild and the symptoms respond to medical and dietary treatment, but the authors consider the operation justified when definite clinical symptoms [illegible] of [illegible] cystitis are noted in [illegible] bladder which was visualized thirty-nine or more hours after administration of the dye. The patients, however, should be thoroughly studied for other disease of the gastrointestinal tract prior to the decision to operate.

ZUSAMMENFASSUNG

Obgleich sich die Verfasser nicht berechtigt fühlen, endgültige Schlüsse auf Grund ihrer Beobachtungen an der kleinen Anzahl der in dieser Arbeit vorgestellten Fälle ziehen zu können, so glauben sie doch, eine Beziehung zwischen einer unvollständigen Entleerung der Gallenblase innerhalb von 39 undr mehr Stunden und krankhaften Veränderungen in der Gallenblase oder den Gallengängen entdecken zu können. In der überwiegenden Mehrzahl ihrer Fälle ging ihre Beobachtung mit klinischen Erscheinungen einher, die schwer genug waren, den Patienten ärztliche Hilfe suchen zu lassen, und in achtzig oder mehr Prozent der Fälle, die zur Operation kamen, ergaben sich ausgesprochene krankhafte Veränderungen der Gallenblase.

Es ist offensichtlich leichter, die Füllung oder Nichtfüllung der Gallenblase am Film 24 Stunden nach Einnahme des Mittels festzustellen, als zu entscheiden, welche Menge des Mittels zwei Stunden nach Verabreichung einer Fettmahlzeit entleert oder konzentriert worden ist.

Die Erkrankung ist oft leichter Natur und spricht auf medizinische und diätetische Behandlung an. Die Verfasser glauben jedoch, dass beim Bestehen ausgesprochener klinischer Symptome und bei Anzeichen von Gallenblasenentzündung bei gleichzeitiger Beobachtung eines bestehenden Gallenblasenschattens 39 oder mehr Stunden nach Verabreichung des Kontrastmittels operatives Vorgehen gerechtfertigt ist. Allerdings muss der Kranke, bevor der Entschluss zur Operation gefasst wird, sorgfältig auf andere Erkrankungen des Magendarmkanals untersucht werden.

RIASSUNTO

Gli autori non si sentono di trarre alcuna conclusione di carattere definitivo da una serie di casi così modesta, tuttavia essi credono di poter affermare che vi è un rapporto fra l'incapacità della colecisti di svuotarsi completamente entro 39 ore e la presenza di alterazioni patologische della colecisti stessa o dei dotti. Nella grande maggioranza dei loro casi questo sintomo si accompagnava a disturbi marcati e, nell' 80% dei pazienti operati, a lesioni evidenti della colecisti.

E' assai più facile, ovviamente, decidere se una colecisti è ancora visibile dopo 24 ore che non valutare l'entità del-suo vuotamento dopo 2 ore.

Sovente la lesione è lieve e i disturbi sono dominabili con la cura medica, ma l'intervento chirurgico è giustificato in presenza di un quadro clinico di colecistite in un malato in cui la colecisti sia ancora visibile dopo 39 ore dalla somministrazione del mezzo opaco. Naturalmente il paziente dovrà essere studiato anche sotto altri punti di vista.

SUMÁRIO E CONCLUSOES

Os Autores não esperam tirar conclusões definitivas de um numero tão pequeno de casos como os apresentados neste artigo. Contudo, em sua opinião, este estudo pelo menos indica haver uma relação entre a falta de esvasiamento completo da vesicula biliar em trinta e nove horas ou mais e alterações patologicas deste argão ou seus ductos. Numa grande maioria de seus casos esta observação foi associada a sintomas clinicos suffcientemente nitidos para levar o pacient ao medico e, daqueles operados, 80% ou mais apresentavam alterações patologicas definidas na vesicula.

Evidentemente é mais facil determinarse se a vesicula é visivel ou não na radiofrafia de vinte e quatro horas do que a determinação da taxa de esvasiamento ou concentração que tenha ocorrido na radiografia de duas horas, após uma refeição gordurosa.

Frequentemente a condição patologica é de natureza leve e os sintomas respondem ao tratamento medico e dietetico, mas os autores consideram a operação justificada quando os sintomas clinicos definidos e os sinais de colecistite são notados na presence de uma vesicula biliar que tenha sido visualizada trinta e nove horas ou mais após a administração do contraste. Contudo, os pacientes devem ser minuciosamente estudos em busca de outras afecções do tracto gastrointestinal, antes que seja feita a indicação operatoria.

RÉSUMÉ

Les auteurs ne demandent pas à faire des conclusions définitives du petit nombre de cas qu'ils présentent dans cet article. Tout de même à leur opinion l'étude clinique indique au moins, qu'une rélation existe entre l'inabilité de la cholécyste d'evacuer complètement en 39 heures et des conditions pathologiques dans cet organ ou ses conduits. Dans une grande majorité de leurs cas cette observation était accompagnée de symptômes clinicaux essez graves, pour faire le malade consulter le médecin, et de ceux qui furent operés, 80% ou plus présentaient des conditions définitivement pathologiques de la vésicule biliaire.

Sans doute il est plus facile, de déterminer, si la cholécyste est vide ou pas sur un film pris après 24 heures, que de déterminer le degré d'élimination ou concentration sur un film pris 2 heures après un repas gras.

Souvent la condition pathologique est legere et les symptomes disparaissent après un traitement médical et diététique, mais les auteurs considèrent une opération justifiée, si on constate des symptomes définitives de cholécystite en présence d'une vésicule biliaire qui est visible 39 heures après l'administration du contraste, ou plus tard. Tout de même le malade doit être examiné carément pour d'auters maladies du tube digestif, avant de décider à opérer.

BIBLIOGRAPHY

Barfield-Carter, M.: The Early History of Cholecystography, *Jefferson-Hillman Hosp. Bull. 3:* 61-64 (April) 1949.

Christensen, W. R., and Sosman, M.D.: A Preliminary Report on Telepaque, a New Cholecystographic Medium, Am. J. Roentgenol. 66:764-768 (Nov.) 1951.

Dannenberg, M.: Cholecystographic Studies with Priodax, Am. J. Roentgenol. 51:328-335 (March) 1944.

Delp, M. H.: Cholecystography in the Presence of Jaundice, J. Kansas M. S. 42:434-436 (Oct.) 1941.

Epstein, B. S., and others: A New Series of Radiopaque Compounds, Am. J. Roentgenol. 56: 201-207 (Aug.) 1946.

Medical Dept., G. D. Searle & Co.: Diagnostic Studies in Gall Bladder Disease, 1943.

Epstein, B. S., and others: A New Series of Radiopaque Compounds, Radiology 54:87-89 (Jan.) 1950.

Feldman, M.: A Comparative Roentgenologic Study of the Gallbladder by Intensified Cholecystography, Radiology 39:697-699 (Dec.) 1942.

Graham, E. A., and Cole, W. H.: Roentgenologic Examination of the Gallbladder, J.A.M.A. 82:613-614 (Feb. 23) 1924.

Hoppe, J. O., and Archer, S.: Observations on a Series of Aryl Triiodo Alkanoic Acid Derivatives with Particular Reference to a New Cholecystographic Medium, Telepaque, Am. J. Roentgenol. 69:630-637 (April) 1953.

Kirklin, B. R.: Cholecystography in Its Fifteenth Year, Southern M. J. 32:822-824 (Aug.) 1939. Background and Beginning of Cholecystography, Am. J. Roentgenol. 54:637-639 (Dec.) 1945.

Kirklin, B. R.: Advantages of the Right Lateral Decubitus in Cholecystography, Texas State J. Med. 46:5-8 (Jan.) 1950. A New Position for Cholecystography, Am. J. Roentgenol. 60:263-268 (Aug.) 1948.

Lowman, R. M., and others: A Preliminary Evaluation of a New Cholecystographic Medium, "Telepaque," Gastroenterol. 21:254-262 (June) 1952.

Maddox, L.: Localization of the Gallbladder, Am. J. Roentgenol. 67:644-645 (April) 1952.

Olin, H. A.: Cholecystography: History of Roentgen Gall [illegible] der Dia [illegible] is and Recent Advances, Illin [illegible] 65:57 [illegible] (Jan.) 1934.

Russo, P. E., and Cavanaugh, C. J.: Newer Methods of Cholecystography, J. Oklahoma State M. A. 43:485-488 (Nov.) 1950.

Sachs, M. D.: Visualization of the Common Duct During Cholecystography, Am. J. Roentgenol. 69:745-765 (May) 1953.

Seedorf, E. E., and others: Telepaque and Pseudoalbuminuria, J.A.M.A. 152:1332-33 (Aug. 1) 1953.

Smedal, M. I.: Cholecystography—the Role of the Stomach Antrum in the Interpretation of Radiographs, S. Clin. North America 32:847-850 (June) 1952.

Sosman, M. D.: Radiologic Aspects of Gall Bladder Disease, New England J. Med. 231:786-794 (Dec. 14) 1944.

Stevenson, D. A.: Roentgenologic Examination of Gallbladder Without Opacification, J.A.M.A. 151:264-265 (Jan. 24) 1953.

Wasch M. G.: A New Medium for Gallbladder Visualization, Am. J. Roentgenol. 50:677-679 (Nov.) 1943.

Weber, H. M.: A New Cholecystographic Medium, Am. J. M. Sc. 207:678-684 (May) 1944.

Whelan, F. J.: Important Details in the Technique of Cholecystography, X-ray Technician 14:151 (Jan.) 1943. Special Cholecystographic Technique, X-Ray Technician 19:230-234 (March) 1948.

Yuhl, E. T., and others: The Cholescystogram, Surgery 34:724-727 (Oct.) 1953.

◆

Systems, scientific and philosophic, come and go. Each method of limited understanding is at length exhausted. In its prime each system is a triumphant success: in its decay it is an obstructive nuisance.

It is a profoundly erroneous truism, repeated by all copybooks and by eminent people when they are making speeches, that we should cultivate the habit of thinking of what we are doing. The precise opposite is the case. Civilization advances by extending the number of important operations which we can perform without thinking about them. Operations of thought are like cavalry charges in a battle—they are strictly limited in number, they require fresh horses, and must only be made at decisive moments.

—*Whitehead*

Steroid Anesthesia in Man: Clinical and Cerebral Metabolic Effects

GILBERT S. GORDAN, M.D., Ph.D., NERI GUADAGNI, M.D.,
JOSEPH PICCHI, M.D., AND JOHN E. ADAMS, M.D.,
WITH THE TECHNICAL ASSISTANCE OF
EDWARD MARTINEZ, B.S., AND PATRICIA McCREERY, M.T.
SAN FRANCISCO, CALIFORNIA

OUR interest in the effect of hormones upon the central nervous system originated from the now well-documented observation that disturbed mental or psychologic function is common in many endocrine disorders. The well-known mental aberrations of myxedema, hypoglycemia, hypoparathyroidism and hyperparathyroidism, hypopituitarism and Addison's and Cushing's diseases are too familiar to require rehearsal here. The widespread use of cortisone and corticotrophin (ACTH) has dramatized the feeling of well-being and exhilaration, as well as the psychoses and convulsions, that these agents may precipitate. The effect of steroids on electroshock seizure threshold has been thoroughly studied by Woodbury,[1] who has shown in the rat, as we have observed in man, that desoxycorticosterone is a potent anticonvulsive agent. This was first noted in 2 epileptic patients by McQuarrie, Anderson and Ziegler[2] in 1942 and confirmed in a larger series by Aird and Gordan[3] in 1951.

An inhibitory effect of steroids upon central nervous system activity was suggested by experiments which Selye[4] reported in 1941. He showed that certain steroids produced anesthesia in rats and in fish and that anesthetic potency did not parallel any of the known hormonal activities of these compounds. Among the most potent agents were desoxycorticosterone, progesterone and pregnandiol, the hormonally inert metabolite of progesterone. Since Michaelis and Quastel[5] had proposed an enzymatic mechanism of action for anesthesia, Gordan and Elliott undertook similar studies of the action of steroids upon brain tissue *in vitro*. Steroids observed by Selye to have anesthetic potency showed parallel inhibitory activity of the oxygen uptake by rat brain cells *in vitro*, but the site of action appeared to be at the dehydrogenase level rather than the cytochromes.[6] That the steroids normally exert a regulatory influence upon cerebral metabolism is suggested by the high rate of oxygen uptake of the brain of the castrate immature male rat.[7] Similar high rates are found in normal preadolescent children[8] and in patients who have never undergone puberty because of testicular or pituitary defects.[9] In the case of the castrate immature male rat it is possible to reduce the accelerated rate of oxygen uptake *in vivo* or *in vitro* by the administration of various steroids.[10] From these studies it appears that steroids with the

---

From the Cerebral Metabolic Laboratory of the Langley Porter Clinic of the State Department of Mental Hygiene and the Departments of Medicine, Anesthesiology, and Neurological Surgery of the University of California School of Medicine, San Francisco.

Read at the Twentieth Anniversary Congress of the International College of Surgeons, Geneva, Switzerland, May 23-26, 1955.

Aided by grants from The Multiple Sclerosis Society and Pfizer Laboratories, Inc., Brooklyn, New York.

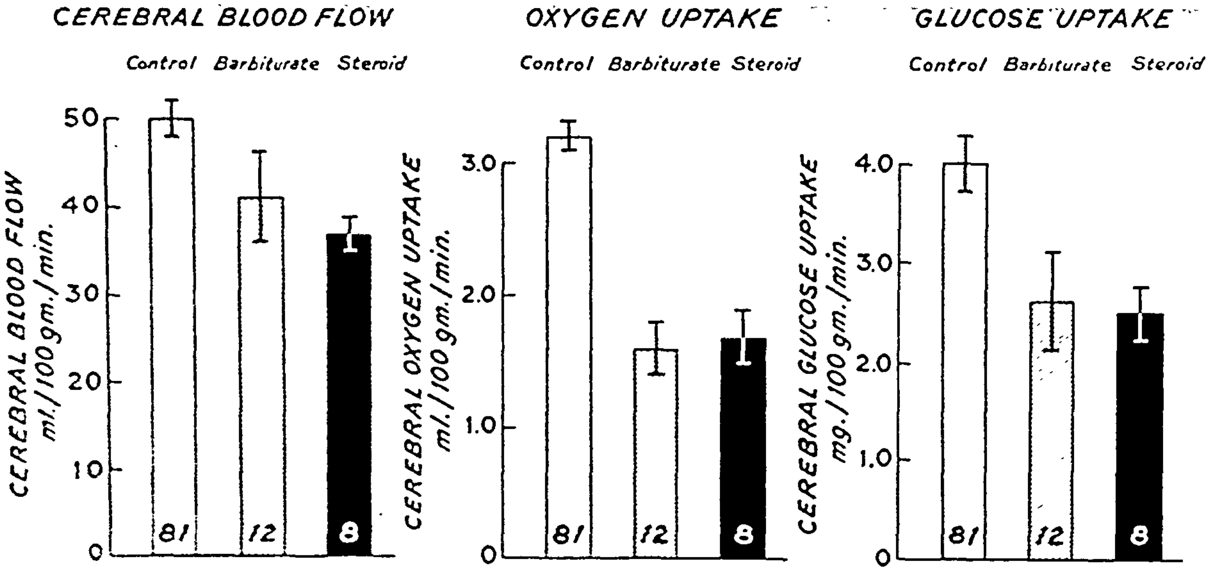
Desoxycorticosterone glucoside was generously donated by Ciba Pharmaceutical Products, Inc., Summit, New Jersey. Sodium testosterone sulfate was supplied by The Upjohn Company, Kalamazoo, Michigan. Heparin (Liquaemin-Organon), used in the cerebral blood flow determinations, was provided by Organon, Inc., Orange, New Jersey. Viadril was supplied by Pfizer Laboratories, Inc.

Submitted for publication July 5, 1955.

androstene nucleus, including testosterone and 21-C steroids, are effective in restoring the "braking" action normally exerted by the sex hormones upon cerebral metabolism.

The water-soluble steroids, desoxycorticosterone glucoside (DCG) and sodium or potassium testosterone sulfate, in doses as large as 250 mg. intravenously, have not produced anesthesia in human subjects. Recently, Merryman and others[11] have observed light hypnosis in patients receiving progesterone dissolved in propylene glycol and human albumin intravenously. We have sought a steroid capable of inhibiting the dextrose and oxygen uptake of the brain but devoid of endocrine or salt-retaining activity as a possible means of inducing anesthesia in man. Recently Laubach, P'an and Rudel[12] of Pfizer Laboratories have observed that the steroid 21-hydroxypregnanedione-3,20 (viadril) induces anesthesia in mice, rats, cats, dogs nd monkeys. The purpose of this communication is to report its action in man.

The water-soluble sodium salt of the steroid hemisuccinate ester was administered intravenously without barbiturate or narcotic premedication to 5 schizophrenic patients and to 3 normal subjects. Anesthesia, consisting of loss of consciousness, insensibility to pain, absence of corneal reflex and presence of muscular relaxation, was produced in 6 of these patients. The first 2 were given the agent only to the point of hypnosis. These 2 had pronounced salivation; this was prevented in subsequent patients by the prior administration of atropine sulfate, 0.6 mg. intravenously. Respiratory depression did not occur during the slow intravenous infusion of viadril in these 8 patients. Pain in the course of the brachial vein was noted when the administration was rapid or the solution was concentrated to 2.5 Gm. per hundred millimeters or more. Hypnotic and anesthetic effects were induced after a lag period of three to ten minutes after the slow intravenous administration of the agent. Recovery was rapid and patients were able to reply to questions eighteen to forty minutes later; seventy-three minutes in the case of the patient who was given 2,000 mg. No depression or other untoward after-effects were observed, except pain in the antecubital fossa and forearm of 1 pa-



Cerebral blood flow and metabolism during anesthesia.

tient. Because the intravenous administration of the water-soluble androgens, testosterone 17-beta-diethyl-amino-ethyl-carbonate hydrochloride and sodium testosterone sulfate, has been reported to cause hemolysis,[13] we have checked the plasma and urine of our patients for hemoglobin. In our experience hemolysis has not occurred after the administration of viadril.

The effect of this agent upon cerebral blood flow (CBF) and cerebral metabolism was measured by the original Kety-Schmidt technic.[14] In each patient a control determination was made prior to the administration of the agent and a second determination twenty minutes later, during the period of clinical effect. The data are graphed in the accompanying chart; for comparison, the rates of cerebral metabolism of oxygen and dextrose in 12 patients anesthetized with combined thiopental sodium, pentobarbital sodium and meperidine hydrochloride are also presented.

The clinical use of viadril as an anesthetic agent for 125 surgical procedures has been studied by Drs. Murphy, Guadagni and DeBon and will be reported by Dr. Murphy. I shall restrict my discussion to the implications of steroid anesthesia in man. The use of a physiologic mechanism, namely the application of the steroid "brake" to cerebral dextrose and oxygen uptake may have some theoretical advantage over the pharmacologic action of the barbiturates. It will be noted that steroid-induced inhibition occurs at a different enzymatic level than does that produced by barbiturates. The lack of respiratory depression from the administration of this agent to patients is undoubtedly a practical advantage. Drs. Eisenberg and Margolis of my laboratory have attempted to use viadril as a "truth serum," without success. The patients are immediately anesthetized and show no cortical release, which suggests that the compound is a true anesthetic rather than a mere hypnotic agent.

I am sure that the surgeons and anesthesiologists would like this compound to act more rapidly. We believe we have a clue to the reason for the lag of approximately four minutes between the administration and the effect of the agent. Dr. H. W. Elliott and Mrs. Vee Sutherland of the Department of Pharmacology, University of California School of Medicine, have studied the action of the unesterified steroid upon the respiration of rat brain slices *in vitro*. They observed a delay of one hundred and twenty minutes before oxygen uptake was inhibited. The lag, observed both *in vivo* and *in vitro*, suggests to us that the compound is converted to an active metabolite. We assume that the conversion is produced more rapidly by the patient's liver than by the small amount of brain tissue in the Warburg flask. Currently we are attempting to isolate and identify such a metabolite in the hope of obtaining more rapidly acting anesthetic agents which will probably be effective in smaller doses.

SUMMARY

The sodium salt of the hemisuccinate ester of the steroid 21-hydroxypregnanedione-3,20, administered intravenously to human subjects, produces anesthesia and cerebral metabolic changes identical with those produced by barbiturates but without respiratory depression.

RIASSUNTO

Il sale sodico dell'estere emisuccinato del 21-idrossipregnanedione-3,20, somministrato per via endovenosa produce nell'uomo un'anestesia analoga a quella da barbiturici, senza determinare depressione respiratoria.

RÉSUMÉ

Le sel de sodium de l'ester hemisucciné 21-hydropregnanedione 3,20, donné par la

voie veneuse, produit l'analgésie et les changements metaboliques cérébraux, identiques à ceux qui sont produits par les barbituriques, mais sans dépression respiratoire.

ZUSAMMENFASSUNG

Die intravenöse Verabreichung des Natriumsalzes des Hemisuccinatesters des Steroids 21-Hydroxypregnanedion-3, 20 ruft beim Menschen Anästhesie und zerebrale Stoffwechselveränderungen hervor, die mit denen durch Barbitursäurepräparate erzielten identisch sind, jedoch ohne Atmungsdepression einhergehen.

RESUMEN

La sal sódica del éster homisuccinado del esteroide 21, hidroxipregnanediona, administrado intravenosamente en el hombre produce anestesia y cambios metabó- os cerebrales idénticos a aquellos pro- idos por los barbitúticos, sin tener el ecto de depresión respiratoria.

REFERENCES

1. Woodbury, D. M.: Recent Progress in Hormone Research 10:65, 1954.
2. McQuarrie, I.; Anderson, J. A., and Ziegler, M. R.: J. Clin. Endocrinol. 2:406, 1942.
3. Aird, R. B., and Gordan, G. S.: J.A.M.A. 145:715, 1951.
4. Selye, H.: J. Immunol. 41:259, 1941.
5. Michaelis, M., and Quastel, J. H.: Biochem. J. 35:518, 1941.
6. (a) Gordan, G. S., and Elliott, H. W.: Endocrinology 41:517, 1947. (b) Hayano, M.; Schiller, S., and Dorfman, R. I.: Endocrinology 46:387, 1950. (c) Hochster, R. M., and Quastel, J. H.: Ann. N. Y. Acad. Sci. 54:626, 1951.
7. Eisenberg, E.; Gordan, G. S., and Elliott, H. W.: Science 109:337, 1949.
8. Kennedy, C.: Personal communication.
9. Gordan, G. S., and Adams, J. E.: Cerebral Metabolism in the Aging Process: The Steroid Factor. In Engle, E. T., and Pincus, G.: Hormones and the Aging Process. New York: Academic Press, 1955.
10. Eisenberg, E.; Gordan, G. S., and Elliott, H.: Fed. Proc. 9:269, 1950.
11. Merryman, J., and others: J. Clin. Endocrinol. & Metab. 14:1567, 1954.
12. Laubach, J.; P'An, S. Y., and Rudel, H. W.: Science 122:78, 1955.
13. Segaloff, A.: J. Clin. Endocrinol. & Metab. 14:244, 1954.
14. Kety, S. S., and Schmidt, C. F.: J. Clin. Invest. 27:476, 1948.

So great is our idea of the grandeur of the human soul that we cannot bear its contempt, or to be deprived of its esteem. All the happiness men enjoy consists in such esteem.

Those who despise men most, putting them on a level with the beasts, nevertheless wish for their admiration and confidence. Thus their own feelings contradict them. For their nature, which is stronger than aught else, convinces them more strongly of the greatness of man than reason convinces them of their vileness.

—*Pascal*

Steroid Anesthesia in Man: A Clinical Report

FRANK J. MURPHY, M.D., NERI P. GUADAGNI, M.D., AND
FRANCIS L. DEBON, M.D.
SAN FRANCISCO, CALIFORNIA

IT has been noted as a matter of academic interest (Selye[1]) that some steroids produce a state of hypnosis or anesthesia.

Laubach, P'an and Rudel[2] subsequently investigated a large number of steroids for their anesthetic potency, therapeutic index, toxicity and duration in animals and found 21-hydroxy-pregnanedione sodium succinate to be most satisfactory. This compound was first identified by the code designation "P-55" and has since been given the name "viadril."

The drug was administered to human subjects by Gordan and associates,[3] who have reported its effect on cerebral metabolism in man. The department of anesthesiology of the University of California then began studying the characteristics of this drug as a practical anesthetic agent in the operating room.

Viadril is a white crystalline powder, soluble in water and having a molecular weight of 432. The resultant solution has a *p*H of 8.5 to 9.8. Its chemical structure is that of a steroid, and is shown in the column opposite.

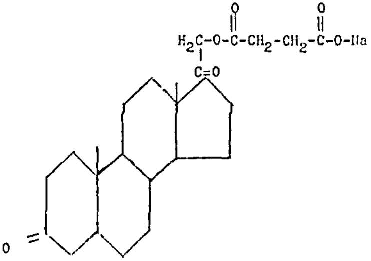
Animal experimentation has shown that viadril has no hormonal effects, causes no salt retention in therapeutic doses and no demonstrable toxic effects on vital organs (Laubach and others[2]), when administered in anesthetic doses. This paper reports the first administration of viadril to a wide variety of surgical patients under ordinary operating room conditions.

We have used viadril as a basal anesthetic in these cases, supplemented usually by nitrous oxide. Work with animals demonstrates that, with larger doses, no supplement was necessary to produce anesthesia. For safety and control, however, we limited intravenous doses and supplemented them with inhalation agents in all but a few cases.

Table 1 classifies the patients as to age and sex. Table 2 lists the operations performed, together with their durations.

Technic.—Viadril has been administered in solution in both distilled water and physiologic solutions of sodium chloride. In either case a 2.5 per cent solution is freshly prepared. An intravenous drip of 5 per cent dextrose in distilled water is started in a vein of the arm. This should run freely. During administration of viadril the stop clock is left wide open.

The viadril solution is injected into the intravenous tubing at a point some distance from the arm, so that mixing and



Structure of 21-hydroxy-pregnanedione sodium succinate (Viadril).

From the Department of Anesthesiology of the University of California School of Medicine, San Francisco

Viadril was supplied by Pfizer Laboratories, Inc.

Read at the Twentieth Anniversary Congress of the International College of Surgeons, Geneva, Switzerland, May 23-26, 1955.

Submitted for publication July 5, 1955.

TABLE 1.—*Age and Sex of Patients*

Age, Years	*No.*
1-10	0
11-20	4
21-30	15
31-40	22
41-50	37
51-60	22
61-70	18
71-80	7
Total	125
Sex	
Male	49
Female	76
Total	125

dilution take place in the tubing before the needle is reached. This injection takes place slowly, so that the drug is washed into the vein with a large amount of the solution. We calculate the strength at which the viadril solution enters the vein as not greater than 1.25 per cent and usually much more highly diluted than this. Generally, we have made the injection into arm veins rather than leg veins, since thrombosis is more likely to occur in the latter. An occasional patient will complain of pains in the arm, but these can be eliminated by reducing the rate of injection. It usually takes about five minutes to give 1,500 mg., and five additional minutes are allowed before the patient is considered ready for any further manipulation.

Although we do not use a standard formula for preanesthetic medication, the average adult patient comes to the operating room after having had 50 to 75 mg. of Demerol, with or without scopolamine, and pentobarbital. Thus, he is not heavily premedicated or drowsy upon arrival in the operating room. This premedication is not changed for patients receiving viadril. We have usually used the drug as a basal anesthetic in combination with nitrous oxide and oxygen. We also have used it in combination with cyclopropane and oxygen and with ether, as well as with the barbiturates and additional doses of narcotics. We also have used muscle relaxants when necessary. The usual supplement has been nitrous oxide and oxygen in the proportion of 3:1, with or without supplemental doses of meperedine.

Results. — This combination of agents has given us highly satisfactory results. With viadril as a base, nitrous oxide becomes a satisfactory, adequate and controllable anesthetic agent. It might be said that viadril has given nitrous oxide the added potency to make it an adequate anesthetic without detracting from its safety and controllability. The use of viadril, combined with different anesthetic agents, reduces the amount of the other drugs necessary.

When given as a preliminary to ether, it allows a smooth induction and markedly decreases the amount of ether required. Gordan and his associates[3] noted that the effect of viadril lasted from eighteen to seventy-three minutes, depending upon the dose. Although their observations were made on patients not necessarily at surgical levels of anesthesia, when the drug is fortified with nitrous oxide and oxygen, or other anesthetic agents, the effect seems to last much longer.

One craniotomy in our series lasted nearly eleven hours. Upon discontinuation of the inhalation agent the patient awakened very promptly and was in excellent postanesthetic condition. Patients under viadril one and one-half to two hours also recover promptly upon discontinuation of the inhalation agent.

In those cases in which intratracheal intubation is planned, it is undertaken about ten minutes after the initial via-

TABLE 2.—*Operations*

Operations		*Intubated*	*Meperidine, Mg.*					*Curare, Mg.*			
Region	No.	No.	1-50	51-100	101-150	151-200	201-250	1-9	10-21	22-33	40
Intracranial	15	15	3	4	4	1					
Intrathoracic	9	9	3	2		2		2	2	1	
Abdominal											***
Upper	17	16	4	6	2		1*	4	6	3	1
Lower pelvic	8	8	2	2	1	1		4	3	1	
Kidney	4	4	1	2				1	1		
Neck	35	23	12	8	6						
Extremities	9	3	2	1	4		1**	1	1		
Perineal	8	1	6	2							
Back	9	5		4							
Chest wall	3		1	1							
Pneumoencephalogram	1										
E.E.N.T.	7	7	2	3	1						
Total	125	91	36	35	18	4	2	12	13	5	1

* Age 65—90 Kg. Gastrectomy—Meperidine 210 mg. dTc 40.5 mg. 6'50".
** Age 33—84 Kg. Median Neurolysis Meperidine 235 mg. dTc 6 mg. 5'30".
*** One case with succinylcholine drip.

dril has been administered. Although the patient may cough when the larynx is disturbed, if the procedure is conducted gently it is almost always possible to accomplish intubation without any difficulty. This may be followed by some slight coughing, but it has not been characterized by laryngospasm or severe breath holding. Very rarely have we found it necessary to administer a relaxant to assist in intubation. A relaxant was necessary only when the initial dose of viadril was insufficient and when subsequent increments were given with good results, or when exceptional physical difficulties existed. Sometimes meperedine, 25 to 50 mg., has been administered immediately after intubation, with the result that whatever coughing there may have been is controlled. As soon as the intratracheal tube has been introduced, the patient is given nitrous oxide and oxygen in the proportion of 3:1.

Most patients undergoing abdominal operations are found to require relaxation greater than that produced by the viadril and nitrous oxide-oxygen. These are given a muscular relaxant, either d-tubocurarine or one of the synthetic preparations, in amounts sufficient to produce the desired results. It has been observed, however, that the amounts necessary are approximately one-third to one-half the estimated dose if the patient had been receiving pentothal instead of viadril. Relaxants have also been given to produce apnea for controlled respiration in certain thoracic operations.

It has been observed that many patients who are breathing spontaneously will allow the anesthesiologist to control respiration without the use of a relaxant. It has not been necessary to administer any relaxant drugs to patients who are undergoing operations that do n uire usual relaxation.

The marked effect upon the laryngeal reflexes has been noted. Patients who are not deeply anesthetized will show some movement upon being strongly stimulated by the initial cutaneous incision. These patients will usually settle down, however, and do not require additional medication.

Complications.—We have used this drug in 125 cases up to the time of writing. In this series some twenty different surgical procedures have been done. On three occasions, thrombophlebitis has developed in the vein in which the viadril was administered. We are reminded of Lundy's experience with the administration of dolitrone.[4] In each of our cases the patient also was lying prone, with the arms above the head, and there seems to have been an excellent possibility of a pooling in the vessel. In addition, each of the patients was anesthetized for an aortagram, and each certainly had marked endarteritis in some vessels. Whether the veins into which the viadril was injected also had some pathologic condition of the venous wall is a question, but, if so, it may have contributed to the result. Aside from this, none of our patients has had any complications following the use of viadril.

COMMENT

There seems to be an inevitable tendency to compare viadril with pentothal sodium in considering its clinical action and usefulness. We look upon this as somewhat unfortunate. In our opinion, viadril is pharmacologically dissimilar to pentothal sodium; the former is an anesthetic, the latter a hypnotic. Barbiturates, used in nondepressant therapeutic doses, produce only sleep. To be used as anesthetics, they must be given in doses sufficient to produce marked depression, particularly of respiration. In the case of viadril the desirable therapeutic effects are produced by doses that do not bring about this depression.

TABLE 3.—*Duration of Anesthesia*

Duration, Hr.	
0-1	5
1-2	20
2-3	28
3-4	30
4-5	15
5-6	11
6-7	12
7-8	2
8-9	1
9-10	1
Total	125

As with other general anesthetic agents, hypnosis is an incidental effect of the drug. It is our opinion that viadril is most properly classified as a true anesthetic. In therapeutic doses it abolishes pain sensitivity, dulls reflexes and produces muscular relaxation and sleep, all without undue depression of either respiration or circulation.

Since it produces all these effects, but not to an "ideal" degree, viadril should not be classified as a strong anesthetic, and for our purposes we have placed it just below cyclopropane and above ethylene with respect to total effectiveness or potency. Not being an exceptionally potent anesthetic, it finds its greatest usefulness as a so-called basal anesthetic. Viadril has given us very satisfactory results when used in this way.

We are currently studying certain pharmacologic actions of viadril in man, which we shall report in a later paper. Electroencephalographic and electrocardiographic studies are under way.

Our experience up to the time of this report indicates that viadril is a therapeutically useful drug in the field of anesthesiology and that its continuing use and investigation will prove profitable. It is quite possible that other steroid compounds will be discovered which will exhibit even more useful anesthetic properties. The present work should prove an encouragement to further search.

SUMMARY

A steroid compound that does not have hormonal activity in the doses used but is useful as an anesthetic has been produced and made available for clinical use. The drug has been given 125 times as a basal anesthetic under ordinary operating room conditions. The technic for administration is described. Clinical results are given. The only complication noted was chemical thrombophlebitis, which occurred in 3 cases.

ZUSAMMENFASSUNG

Es wird über die Herstellung einer Steroidverbindung berichtet, die in der verabreichten Dosierung keine hormonale Aktivität besitzt, aber als Anästhetikum wirksam ist und zum klinischen Gebrauch zur Verfügung steht. Das Mittel ist 125 mal als Anästhetikum unter den üblichen Krankenzimmerbedingungen angewendet worden. Die Technik der Verabfolgung und die klinischen Ergebnisse werden beschrieben. Als einzige Komplikation wurde in drei Fällen eine chemische Thrombophlebitis beobachtet.

RÉSUMÉ

Une composition stéroide a été produite et mise en circulation pour l'usage clinique, qui n'a pas d'activité hormonale dans la dose employée, mais qui peut servir comme analgésique. Le produit a été donné 125 fois comme analgésique basique dans des conditions normales. La technique d'administration et les résultats clinques sont décrits. La seule complication qu' on a vu était une thrombophlébite clinique, qui était observée dans trois cas.

RIASSUNTO

E' stato prodotto e messo in commercio uno steroide sprovvisto di attività ormonica ma utile come anestetico. Questo farmaco è stato usato in 126 casi come anestetico di base, secondo una tecnica che viene descritta. Unica complicanza una tromboflebite chimica, che si verificò in 3 malati.

RESUMEN

Se dispone para uso clínico de un compuesto esteroide que en las dosis usadas no tiene acción hormonal pero resulta útil como anestésico. La droga ha sido administrada 125 veces como anestésico basal. Se describe la técnica de administración. Se consignan los resultados clínicos. La única complicación que se observó fué una tromboflebitis química que ocurrió en 3 casos.

REFERENCES

1. Selye, H.: Studies Concerning the Correlation Between Anesthetic Potency, Hormonal Activity, and Chemical Structure. Among Steroid Compounds, Anesth. & Analg. 21:41-47, 1942. Anesthetic Effect of Steroid Hormones, Proc. Soc. Exp. Biol. & Med. 46:116-121, 1941. Acquired Adaptation to the Anesthetic Effect of Steroid Hormones, J. Immunol. 41:259-268, 1941.

2. Laubach, G. D.; P'an, S. Y., and Rudel, H.; A Steroid Anesthetic Agent, Science, to be published.

3. Gordan, G. S.; Guadagni, N.; Picchi, J., and Adams, J. E.: Steroid Anesthesia in Man: Clinical and Cerebral Metabolic Effects, to be published.

4. Lundy, J. S.: Developments of Analgesia After a Century of Anesthesia, J.A.M.A. 157:1399-1403, 1955.

Cardiovascular Surgery

Intra-Arterial and Subcutaneous Oxygen in the Treatment of Peripheral Arterial Disturbances

FRITZ JUDMAIER, M.D.[*]
INNSBRUCK, AUSTRIA
AND
HERBERT A. ROEDLING, M.D.[**]
MILWAUKEE, WISCONSIN

INTRA-ARTERIAL oxygen was first used by the Fiolle brothers[1] in 1914 to inject the carotid artery for the treatment of gas gangrene. Morphy[2] used intra-arterial oxygen for the therapy of pneumonia in 1920. Results of this therapy were not encouraging. During a study for arteriography with intra-arterial oxygen, Lemaire, Loeper and Housset[3] noticed vascular changes seemingly beneficial to the patient.

In 1949 one of us (F. J.)[4] started to investigate intra-arterial oxygen therapy in the treatment of peripheral arterial diseases. In conjunction with the intra-arterial oxygen therapy in some of the patients, several different vasodilators were evaluated. Subsequently the use of intramuscular and subcutaneous oxygen was also introduced into the study. We designed an apparatus that accurately controlled administration of intra-arterial oxygen. Incidentally, it was also found that roentgen arteriopneumographic observation was possible during therapeutic administration of intra-arterial oxygen and in many cases provided adequate delineation of the vascular disease, thus removing the necessity for angiographic procedures with radiopaque materials.

Effect of Oxygen. — Intra-arterial oxygen, because of its long-lasting effect, low cost, simplicity of administration and ready availability, is superior to previously tested drugs such as priscoline, hydergine, roniacol, padutin, acetylcholine chloride and histamine phosphate. The same advantages give it preference over rhythmic massage of the peripheral vessels synchronously with the pulse wave, which has been applied with an apparatus called syncardon.[*] In cases of far advanced peripheral arterial disease with large areas of gangrene, no remarkable improvement was noted. The best results were obtained in those cases in which the only symptom was intermittent claudication or in which there was evidence of re-

---

[*] Assistant Professor of Surgery, University Hospitals, Medical School, Innsbruck, Austria.

[**] Resident, Columbia Hospital, Milwaukee, Wisconsin.

From the Vascular Clinic Department of Surgery, University Hospital, Innsbruck.

Submitted for publication Oct. 24, 1955.

cent gangrene. Intra-arterial oxygen is also effective in the treatment of patients who have total occlusion of a main artery and whose collateral circulation is only poorly developed. In these patients intra-arterial oxygen greatly aids the development of the collateral circulation.

A 38-year-old white man with a history of multiple duralumin injuries was treated in an Army field hospital during World War II on an emergency basis, receiving only first aid. He entered the hospital in 1943, a few weeks after his injuries. Examination revealed multiple duralumin splinters in all extremities. All open wounds on admission were débrided and healed by first intention except in the right calf, where severe cellulitis developed, requiring a midthigh amputation.

The duralumin splinters in the left leg and upper extremities caused no clinical reaction. Six years later, however, the patient returned with the chief complaint of intermittent claudication of the calf muscles, rest pain, cold left foot with gangrene of the big toe, and cold hands. Roentgen examination revealed no evidence of duralumin fragments. These fragments had not become sequestered but had been absorbed. The impression was that in all probability the absorption of this light metal caused a localized toxic reaction manifesting itself as generalized endarteritis obliterans. Examination revealed the following data:*

Left Upper Extremity
Fingers: coldness, rubor
Pulses: radial 1
cubital 2
brachial 3

Right Upper Extremity
Fingers: coldness, rubor
Pulses: radial 1
cubital 1
brachial 3

Left Lower Extremity
Coldness, dependent rubor, pallor on elevation, superficial gangrene left great hallux
Pulses: femoral 3
popliteal 0
dorsalis pedis artery 0
tibialis 0

Right Lower Extremity
Amputation stump healed by first intention
Pulses: femoral 3

Thoracoscopic sympathectomy by the Kux method was performed, the thoracic sympathetic chain being visualized through an endoscope. This relieved all signs and symptoms of endarteritis obliterans in the upper extremities. The signs and symptoms referable to the lower extremity, however, were unimproved by a left lumbar sympathectomy performed on the first to the fourth lumbar neural arch. After two months, injections of 100 cc. of intra-arterial oxygen thrice weekly were instituted and continued for four weeks. In addition, injections of 200 cc. of subcutaneous oxygen were given once a week for localized gangrene in the great toe. Great symptomatic improvement occurred after four weeks of treatment. All symptoms, including intermittent claudication, were absent after six weeks. The superficial gangrene on the left great toe disappeared. Arteriograms revealed good collateral circulation. After remission of all signs and symptoms, the oxygen treatment was continued for four years because of the patient's fear of losing his remaining leg. During this four-year period the patient was given 165 intra-arterial oxygen injections.

In our opinion this case demonstrates the harmlessness of intra-arterial oxygen treatment when employed under proper conditions. In many patients one injection caused lasting remission of all signs and symptoms after other commonly used methods had given only short periods of relief.

Oxygen therapy causes more loops of capillaries to dilate than does any other form of treatment. This was revealed by studying the base of the great toenail under the microscope during various forms of therapy (Fig. 1). Our criterion for judging improvement of peripheral circulation was the demonstration, under the capillary microscope, of the following changes:

1. Increased capillary dilation
2. New capillary formation
3. Increased capillary blood flow
4. Continuous capillary blood flow
5. Straightening of the capillaries.

For comparison, the following drugs were used:

---

*The quality of the pulse is based on a grading of 0 to 4.

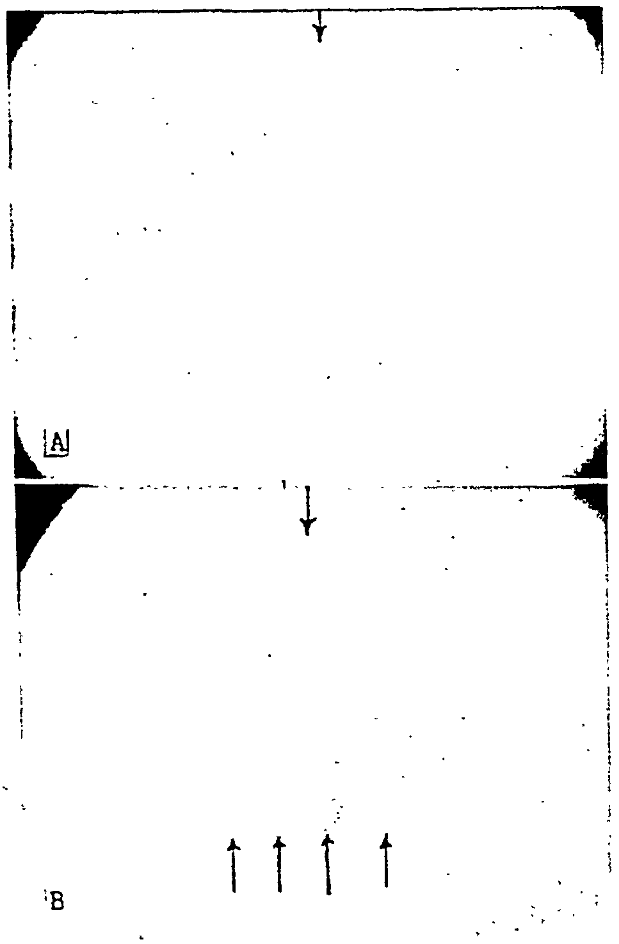


Fig. 1.—*A*, photomicrograph of the vascular bed of the big toe through the base of the big toe nail, prior to intra-arterial injection of oxygen. The single arrow indicates the artefact. The remaining arrows point to the visible capillaries. *B*, identical area as recognized by the artefact in the nail, showing the capillary dilatation. The increased number of capillaries as compared with the first photograph (1*A*) is probably due to empty capillaries which could not be visualized in the first photomicrograph. The arrow indicates the artefact.

Priscoline 2-benzyl-4, 5-amidazoline hydrochloride)
Hydergine (methane sulfonates of dihydrogenated ergotoxic alkaloids)
Roniacol (beta-pyridyl carbinol)
Padutin (brand of vascormone)
Acetylcholine chloride
Histamine phosphate.

All of these drugs, with the exception of acetylcholine, failed to cause much improvement in the capillary picture.

In 85 per cent of the patients it was observed that the capillary bed became greatly enlarged and showed symptomatic improvement. In 15 per cent the capillary bed did not improve, and it was in these patients that no clinical or symptomatic improvement occurred.

Complications.—At the time of writing, more than 4,000 injections of intra-arterial oxygen have been given to 235 patients. If the proper technic and equipment are used there is very little danger of complications. The procedure is certainly no more hazardous than a lumbar parasympathetic block.

Errors in technic include (1) injection of the oxygen in the femoral vein, resulting in pulmonary gas embolus, and (2) too rapid and forceful oxygen injection, which may cause a retrograde flow via the iliac artery, aorta, carotid artery, or left vertebral artery, manifesting itself as cerebral gas embolism.

When oxygen is injected at the proper rate the filling is limited to the distal arterial tree. If given in excess of the proper rate, the proximal arterial vessels will also fill. Should the oxygen reach the epigastric vessels, the patient has the urge to void or defecate, and hyperemia of the skin on the lower part of the abdomen is observed. Though these signs and symptoms are alarming, no harm results from the oxygen injection if promptly discontinued.

In this series only one serious complication occurred in 235 patients treated with intra-arterial oxygen.

A 69-year-old white man entered the outpatient department for vascular diseases in 1949. After examination a diagnosis of arteriosclerotic peripheral arterial disease was made. The symptoms were those of intermittent claudication. Acetylcholine and oxygen were given intra-arterially, and within three weeks the intermittent claudication disappeared. Throughout the period the patient was treated as an outpatient. After ten weeks he returned for oxygen therapy because of a recurrence of intermittent claudication. He was then given two more courses of intra-arterial oxygen injections and remained free from symptoms for one year. When the third course of oxygen therapy was started, the patient fainted when he arose and attempted to dress.

The pathologic picture was that of left cerebral cortical irritation accompanied by epileptic-form convulsions on the following day. Examination of the fundus at the time of the first attack showed no free gas in the fundic arteries. After several days the signs of cortical irritation and the convulsions disappeared, but the patient still had limitation of his vision.

He was discharged two weeks later, with partial visual loss. He was able to see and count fingers 10 feet (253.8 cm.) away. Further investigation revealed that this patient had had two epileptic seizures of the grand mal type prior to treatment. The patient had concealed this fact on admission; after the complications occurred, he admitted the attacks. Had he done this on admission, intra-arterial oxygen would not have been administered, as epilepsy is a definite contraindication. Because of the patient's past history, we cannot be certain whether he had a cerebral vascular accident or a cerebral gas embolism. Since the puncture was definitely in the femoral artery, the only possible way for gas embolism to occur would be by retrograde flow, as has been explained. To prevent a recurrence of this possible complication, we have taken these precautions:

1. The patient must remain supine for several minutes after the injection.
2. The extremity is moderately elevated for several minutes immediately after the injection.
3. The vessel is auscultated during and after the injection, when a susurrus should be heard.
4. When the arterial susurrus is no longer heard, the surrounding tissue is palpated for gas crepitation due to the fact that the oxygen has reached the surrounding tissues.

Today all patients treated with intra-arterial oxygen in the vascular clinic are on the outpatient basis. Intra-arterial oxygen therapy is not used in the upper extremity, because the brachial artery is much too close to the carotid artery, increasing the probability of cerebral gas embolism. For peripheral vascular disease in the upper extremity, the Kux method of thoracoscopic sympathectomy should be employed.[5]

Technic. — The intra-arterial oxygen insufflation technic is as follows: From an oxygen tank the gas passes via a valve to a water bottle and then into an apparatus resembling that used in pneumothorax. The displacement of the water in the bottle measures the exact amount of oxygen administered. A manometer is also set in the system to indicate the pressure under which the gas is being administered (Fig. 2).

The femoral artery is punctured with a small-gauge needle. The apparatus is connected with a pressure setting equal to the systolic blood pressure. This allows the gas to be administered during the diastolic phase only. Within ten to fifteen seconds, 50 to 150 cc. of oxygen is allowed to enter the artery. The exact time required for the oxygen administration is noted by observing two factors: (1) the fluctuation of the water column synchronous with pulsation, and (2) the rhythmic blowing

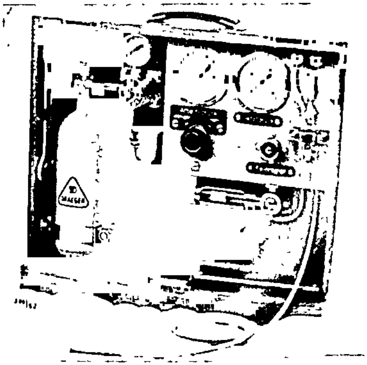


Fig. 2.—A commercial adaptation of the [illegible] apparatus, manufactured by the [illegible] Company (Germany).

sound at the site of the puncture. The rate of oxygen insufflation varies proportionately to the gauge of the needle and the ratio of the systolic to the diastolic pressure.

Soon after the injection the patient's skin becomes pale and then pink. The erythema sometimes extends to the umbilicus. One need not be alarmed if the peripheral pulse of the lower extremity disappears temporarily since oxygen is compressible and will not transmit the pulse wave. Within a few minutes the pulse, if present before the procedure, will return, and the extremity will be warm and dry.

It was possible to evaluate the condition and the course of the arteries by location of the cramplike pain and the course of the prickling sensation descending in the extremity.

We shall now list some of the symptoms observed by different patients, which are characteristic of their specific pathologic conditions:

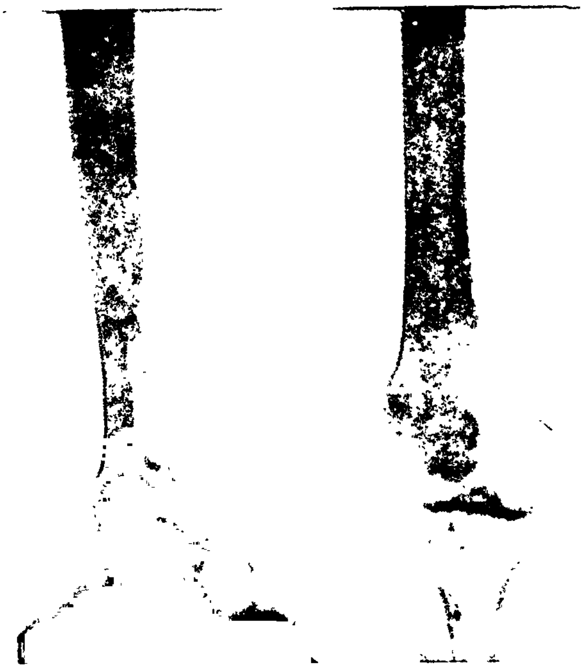


Fig. 2—Arterial pneumogram showing the femoral artery on the right and the posterior tibial on the left. One can see the bifurcation of the anterior and posterior tibial arteries.

1. If the oxygen goes directly to the toes via the femoral, popliteal and tibialis arteries, the patient immediately notices a prickling sensation all the way to the toes.
2. If the prickling sensation is confined to the posterior aspect of the thigh, the femoral artery is probably occluded and the gas is flowing via the femora profunda artery. The patient also usually feels pain at the site of occlusion, owing to dilatation of the artery proximal to the occlusion. Arteriopneumographic study demonstrates the occlusion if exposure is made at this time.

Oxygen Tissue Therapy: We have also used oxygen subcutaneously and intramuscularly as aforementioned, in this way bringing the gas directly to the affected area. Oxygen (200 to 300 cc.) was infiltrated into the extremity in such a way that it was distributed over the calf and foot. This procedure causes no pain to the patient, and it is simple to perform. In many cases of peripheral vascular disease we have had good results when subcutaneous oxygen was used alone and better results when it was used in connection with intra-arterial oxygen therapy. We have noted that subcutaneous oxygen therapy gives excellent results in patients with superficial gangrene. This method appears to be completely harmless; no complications occurred in over 300 patients. The same technic as is employed in intra-arterial injection is applied, with precautions taken to make sure that one has not entered a vessel, in order to prevent embolism. As the gas is injected one can follow its course, which is usually that of the larger veins. At first it appears as if the veins are swelling, but this is only the gas following the course of the fascial planes around the veins. In addition to a prickling sensation during this injection, the patient notices a warm sensation in the extremity, which lasts for a relatively long time. Objectively, erythema follows pallor.

Arteriopneumographic Study. — Roentgenograms taken simultaneously with the therapeutic intra-arterial oxygen injection clearly point out any alterations and occlusions of the main artery. This eliminates the need of contrast studies in some cases. Arteriopneumographic study, however, does not reveal any information with regard to the collateral vessels or the retrograde flow in the veins (Fig. 3).

Results. — Our results are based on 4,000 intra-arterial oxygen injections in 235 patients. Most of these patients were followed for one to four years. The types and stages of the diseases treated are listed in Table 1. Whenever necessary, the oxygen therapy was repeated.

Occasionally the differential diagnosis between arteriosclerotic disease and thromboangiitis obliterans could not be made because the arteriogram and clinical data were indecisive. The age of 45 years is our criterion for tentative classification.

The 8 patients with Raynaud's disease treated by this method refused thoracoscopic sympathectomy. Oxygen was administered subcutaneously to these patients.

In patients with acute arterial embolism, embolectomy was performed first and oxygen therapy used postoperatively.

Frostbite is best treated by sympathetic nerve block, and only for patients with residual symptoms or persistent ulcers was subcutaneous oxygen therapy used.

The severity of disease in the 235 patients was variable, especially in those with arteriosclerosis who ranged from the symptomatic stage only to the stage in which there were large areas of gangrene requiring amputation. In those patients who had far advanced disease we observed no improvement from the oxygen therapy. If the area of gangrene was small, however, improvement and often complete recovery were achieved by this method. In 29 patients with early peripheral disease we accomplished complete recovery in 20 (69 per cent) with intra-arterial oxygen. The walking tolerance of these patients was unlimited upon recovery (Tables 2 and 3).

TABLE 1.—*Diseases Treated*

1.	Degenerative vascular disease (arteriosclerosis, arteriosclerosis of diabetes)	134
2.	Thromboangiitis obliterans (Buerger's disease)	81
3.	Raynaud's disease	8
4.	Postembolectomy for residual symptoms	20
5.	Frostbite residual	12

TABLE 2.—*Completed Figures on All Cases*

	Cases	*Complete*	*Improved*	*No Improvement*
Far advanced peripheral vascular disease with ulceration or gangrene	39	3	14	22
Moderately advanced peripheral disease with absence of lower arterial pulse and intermittent claudication	187	26	122	39
Early peripheral vascular disease with intermittent claudication	29	20	9	0

TABLE 3.—*Breakdown of Table 2 according to specific diseases*

	Cases	*Complete*	*Improved*	*No Improvement*
Arteriosclerosis, diabetic arteriosclerosis	134	28	63	43
Thromboangiitis obliterans (Buerger's disease)	81	14	56	11
Raynaud's disease	8	1	6	1
Residual postembolectomy	20	4	10	6
Frostbite residual	12	2	10	0

SUMMARY

1. Four thousand intra-arterial oxygen injections given to 235 patients, with only 1 complication.

2. Symptomatic relief from the intra-arterial injection of oxygen was obtained in about 74 per cent of the patients.

3. Arterial pneumographic study was incidental and often demonstrated the point of occlusion.

4. Capillary vasodilatation was demonstrated photomicrograpically.

5. Intramuscular or subcutaneous oxygen therapy was a useful adjunct to the treatment of superficial gangrenous areas.

6. The cost of the apparatus is reasonable, and the technic is free of complications.

ZUSAMMENFASSUNG

1. Es wurden an 235 Kranken 4000 intraarterielle Sauerstoffeinspritzungen mit Auftreten von nur einer einzigen Komplikation ausgeführt.

2. In etwa 74 Prozent der Fälle führte die intraarterielle Sauerstoffeinspritzung zu symptomatischer Erleichterung.

3. Gelegentlich liessen sich pneumographische Untersuchungen der Arterien anstellen, wobei es oft möglich war, die Stelle der Gefässverstopfung nachzuweisen.

4. Kapilläre Gefässerweiterung wurde photomikrographisch dargestellt.

5. Intramuskuläre und subkutane Sauerstoffbehandlung erwies sich als ein nützliches Hilfsmittel zur Behandlung oberflächlicher Gangrän.

6. Die Kosten des Apparats sind mässig, und die Technik bietet keine Komplikationen.

RIASSUNTO

1. In 235 malati furono eseguite 4000 iniezioni intraarteriose di ossigeno con una sola complicazione.

2. Nel 74% dei casi si ottenne un miglioramento dei disturbi.

3. Venne eseguito qualche studio arteriopneumografico e spesso fu possible mettere in evidenza la sede dell'occlusione.

4. La vasodilatazione capillare fu dimostrata con la fotomicrografia.

5. L'ossigeno intraarterioso o sottocutaneo è un ottimo ausilio terapeutico nella cura delle gangrene superficiali.

6. Il costo dell'apparato per la somministrazione è modesto e la tecnica è semplice e sicura.

RÉSUMÉ

1. 4,000 injections intra-artérielles d'oxygen sont faites à 235 patients avec une seule complication.

2. Presque 74 pour cent des malades ainsi traités ont éprouvé un soulagement symptomatique de l'injection intra-artérielle d'oxygen.

3. Un examen pneumographique des artères était fait par incident qui souvent a démontré le point d'occlusion.

4. On a pu démontrer par la photomicrographie une vasodilatation capillaire.

5. L'administration intramusculaire ou sous-cutanée d'oxygen a été un bon supplément au traitement des régions superficielles gangreneuses.

6. Le coût de l'appareil est raisonable et la technique d'administration est dépourvue de complications.

SUMÁRIO

1. Foram feitas 4.000 injeções intra-arteriais de oxigenio em 235 pacientes, com apenas 1 complicação.

2. O alivio simtomatico com a injeção intra-arterial de oxigenio foi obtido em cerca de 74 por cento dos pacientes.

3. O estudo pneimografico arterial foi acidental e frequentemente demonstriu o ponto de oclusão.

4. A vasodilatação capilar foi demonstrada microfotograficamte.

5. O emprego do oxigenio subcutaneo ou intramuscular constituiu adjunto util no tratamento de areas gangrenosas superficiais.

6. O custo do aparelho é rasoavel e a tecnica se apresenta livre de complicações.

REFERENCES

1. Fiolle, J.: Cited by Arthold, M.: Die intra-arterielle Ingektion, Wien. med. Wchsnschr. 339: 1951.

2. Morphy: Cited by Möller, H.: Behandlung bei Alters u. Geffaesserkrankungen, Therapiewoche 17-18:433, 1953-1954.

3. Lemaire, A.: Loeper, J., and Housset, E.: Les injections intra-arterielles d'oxygene dans les arterites des membres, Bull. Acad. nat. med. 132: 384, 1948.

4. [illegible] peripherer [illegible] Wchsnschr. [illegible] r Sauerstofftherapie bei peripheren Durchblutungstörungen, M. Klinik. 23:816, 1953. Zerebrale Gasembolie nach intra-arterieller Sauerstoffinsufflation. Münch. Med. Wchsnschr. 35:936, 1953. Möglichkeiten und Grenzen der Arteriopneumographie, to be published.

5. Kux, E.: Thorakoskopische Eingriffe am Nervensystem. Steittgart: Georg Thieme, Verlag, 1954.

ADDITIONAL SOURCES

Möller, H.: Behandlung bei Alters u. Gefaesserkrankungen, Therapiewoche 17-18:433, 1953-1954.

EVERY ISSUE A "SPECIAL" ISSUE

In recognition and appreciation of the fine work so well begun and so admi continued by the various Specialty Sections within the College, the *Journal o International College of Surgeons* begins the year 1956 in a new form, that of gorical presentation of original scientific articles. For a full explanation o converging factors that made this innovation both necessary and desirable, see *Comments by the Founder*, Bulletin Page 3.

I. Experimental Surgical Approach to the Aortic Valve in the Dog

ALDO PARENTELA, M.D., ENZO DE CESARE, M.D.
AND
FERDINANDO LANNUTTI, M.D.
ROME, ITALY

THE importance of developing a method of surgical treatment of aortic stenosis cannot be overemphasized, because acquired aortic stenosis, resulting from rheumatic heart disease, is the second most common acquired stenotic valvular deformity.

Tuffier is credited with the first clinical attempt to relieve aortic stenosis (1913), but little consideration was given to the investigation of this problem until the work of Smithy and Parker again focused attention upon it.

Many reasons make surgical care of the aortic valvular disease very difficult: both the ventricular and the aortic routes are hazardous because of conditions peculiar to the tissues traversed. The ventricle tends to fibrillate with surgical trauma, and, in addition, as with aortic stenosis the intraventricular pressure is very high, the hypertrophied myocardium may be unable to hold closing sutures. It is also very hard to mobilize the ascending portion of the aorta, especially because of the pulmonary artery, which resists separation and is so tenaciously adherent to the aorta itself that inadvertent damage to both vessels must be anticipated. Anatomically, in addition, the ascending aorta forbids easy approach and often proves friable, so that the smallest incision may sometimes cause fracture of its wall.

Many reports have appeared in the literature pertaining to methods of surgical approach to the aortic valve. Some of them have been applied to man; others must be considered an experimental expression of the interest evoked by the problem in many authors. Pearl and his associates have recently summarized these reports.

We conducted the present research after we read the paper by Satinsky and his associates on the experimental transplantation of the complete arch of the aorta, in which the authors suggested a procedure they said was not difficult. We found this procedure logical and reasonable, and we thought that it could be applied safely and satisfactorily to the treatment of stenosis of the aortic valve.

Experimental Methods and Results. — Experiments were then made, both at normal blood pressure and with the aid of hypotension, in 10 healthy mongrel dogs under nembutal anesthesia. The left side of the chest was entered through the fifth interspace, respiration being maintained by means of continuous hand control by the anesthetist.

The pericardium was incised parallel to the phrenic nerve, from above the aortic arch to the apex of the heart; retention sutures of No. 3-0 silk were placed to retract the pericardium itself, and were anchored along the sternal edge of the incision. The ascending portion of the aorta was dissected out and stripped of fat and

[illegible] (Head: Prof [illegible]
[illegible]
[illegible] a grant from the [illegible]
[illegible]

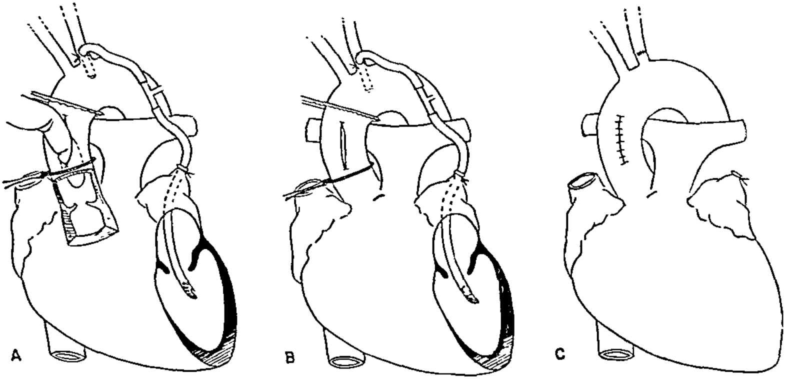


Fig. 1.—Schematic drawing of operative technic (see text).

pericardium, particular attention being paid to the pulmonary artery. A purse-string suture was placed around the left auricular appendage, which was then clamped and incised. The large-bored end of an unlined polyethylene tube was passed down through the mitral valve into the left ventricle; immediately thereafter the purse-string suture was tightened. The ventricular end of the tube was tapered and had multiple perforations to minimize the possibility of complete occlusion by apposition of the ventricular walls.

Another unlined polyethylene tube was introduced into the aortic arch through the left brachiocephalic artery and connected with the one in the left ventricle by means of a siliconized T-shaped glass tube, the purpose of which was to prevent air embolization; by-passing of the aortic valve was then obtained, not very differently from that described in 1910 by Carrel and, more recently, by Clatworthy and Varco (1950), Shaffer and Hardin (1952), Hubay and his colleagues (1952), Cross and his co-workers (1954) and Satinsky and his collaborators (1955).

This by-pass was not complete, of course, but the tube in the heart permitted some flow of blood through the incompletely obstructed mitral orifice for left ventricular filling, and also provided the left ventricle with an outlet, although a valveless one. The coronaries were supplied by blood passing from the left ventricle through the aortic valve.

The aorta was then clamped with a Crafoord clamp proximal to the right brachiocephalic artery, and an unrolled square of surgical gauze was wrapped around it, as near as possible to the valvular plane but distal to the coronaries, to provide circumferential constriction, with the aid of a modified Rumel-Belmont tourniquet, around the operating finger during the intra-aortic stage of the procedure (see illustration, *A*).

During this time the cerebral blood flow was maintained through the by-passing tube, which could also provide blood satisfactorily to the general body flow, according to the well-known fact that the body will tolerate a reduction of the cardiac output down to 50 per cent per minute of the original amount, and that the vital organs below the neck can tolerate rather long periods of anoxia.

A 4 cm. longitudinal incision was then made on the anterior aspect of the ascending aorta, between the Crafoord clamp and the modified Rumel-Belmont tourniquet: an ungloved finger was introduced, and the tourniquet itself was tightened around it (see illustration, *B*) ; the finger tip was advanced cautiously toward the aortic valve. In the whole series it was possible to palpate this valve and enter the left ventricle: there was slight leak from the incision on the aortic wall, but this was ignored unless the amount of leakage was large. Only 2 dogs died during this procedure from rupture of the aortic wall. In all the other instances we first applied two stitches of No. 2-0 silk 4 cm. apart and then made the incision on the aortic wall between them; by this means we could always perform the intra-aortic stage of the operation satisfactorily and safely.

After completion of this maneuver the finger was drawn out and the incision on the aortic wall repaired. We used a continuous mattress suture in No. 4-0 silk on curved atraumatic needles, reinforced by suturing a strip of free pericardium over it.

The Crafoord clamp and the modified Rumel-Belmont tourniquet were then released, and the by-passing tube was withdrawn from the left auricular appendage and from the left brachiocephalic artery, which were sutured: in 3 cases it was possible to perform an end-to-end anastomosis of the divided brachiocephalic artery (see illustration, *C*).

All dogs survived except 2, which died during the operation from unmanageable induced hemorrhage. Ten dogs were then operated upon, after hypotension had been induced by means of pendiomid (Ciba), injected intravenously. The average systolic blood pressure was about 100 mm. o mercury. The same technic was followe as has been described. All the animals tolerated the operation easily and survived

CONCLUSIONS

We should like to conclude by sayin that, ideally, stenotic disease of the aorti valve should be treated by operation unde direct vision in the open heart in a dr field; this type of procedure is being done but it has not yet advanced to the point o practicality. Until it has been adequatel developed, artificial devices that afford th surgeon some help in his work will continue to be of some interest and perhap of some use.

The procedure we have described, especially with the aid of hypotension, is i our opinion logical and reasonable, an there seems to be no good reason why i should not be fully available to clinical application in human patients.

SUMMARY

The authors describe an experimenta procedure for approaching the aorti valve, which they applied alone in 10 dog and in 10 other dogs with the aid of previously induced hypotension.

Author's Note: My chief, Professor Raffael Paolucci di Valmaggiore, watched the progress o this investigation with the keenest interest. I an deeply indebted to him for his kind support, hi sound advice and his constant encouragement. I is a pleasure to record my grateful acknowledgments to Associate Professor Giuseppe Bendandi In the planning and execution of this investigation his enthusiasm, stimulating comments an valuable criticism have been of incalculable benefit. I am indebted also to Dr. Enzo de Cesare an to Dr. Ferdinando Lannutti, whose expert hel considerably facilitated the surgical work. Grateful acknowledgment is also due to C. V. Heljestrand Co.—A. B., Eskilstuna, Sweden, whos experimental department manufactured the instrument.

ZUSAMMENFASSUNG

Es wird ein experimenteller Zugangswe zur Aortenklappe beschrieben, der an zeh

Hunden und an zehn weiteren, bei denen vorher eine Herabsetzung des Blutdruckes ausgeführt worden war, angewandt wurde.

RIASSUNTO

L'autore descrive un metodo di accesso alla valvola aortica che egli ha usato nei cani, 10 volte in condizioni normali e 10 volte in ipotensione.

RÉSUMÉ

Les auteurs décrivent une procédure expérimentelle pour l'opération à la valve aortique qu'ils ont appliqué à 10chiens a l'aide d'hypotension artificielle préoperative.

SUMÁRIO

Os AA. descrevem um metodo experimental para acesso à valvula aortica, metodo este aplicado isoladamente em 10 cães e em outros 10 cães com o auxilio de hipotensão previamente induzida.

BIBLIOGRAPHY

Carrel, A.: On the Experimental Surgery of the Thoracic Aorta and the Heart, Ann. Surg. 52: 83, 1910.

Clatworthy, H. W., and Varco, R. Z.: A Small Bore Polythene Shunt to Prevent Mechanical Shock After Prolonged Cross-Clamping of the Thoracic Aorta, Proc. Soc. Exper. Biol. and Med. 74:434, 1950.

Cross, F. S.; Kay, E. B., and Jones R. D.: A Simple Shunting Technique for Surgery of the Aortic and Pulmonary Valves and Proximal Great Vessels, J. Thoracic Surg. 28:229, 1954.

Hubay, C. A.; Izant, R. J.; Holden, W. D., and Eckstein, R. W.: Hemodynamic Effects of a New Aortic Shunt, Surg. Forum, Clin. Cong., Philadelphia, 1952.

Pearl, F. L.; Michels, L.; Jacobson, J., and Orbelian, V.: Experimental Surgical Approach to Aortic Valve, Arch. Surg. 70:79, 1955.

Satinsky V. P.; Neptune, W. B., and Alai, J.: Experimental Transplantation of the Complete Arch of the Aorta, Ann. Surg. 141:38 1955.

Shaffer, P. W., and Hardin, C. A.: The Use of Temporary Polythene Shunts to Permit Occlusion, Resection and Frozen Homologous Graft Replacement of Vital Vessel Segments, Surgery 31:186, 1952.

Smithy, H. G., and Parker, E. F.: Experimental Aortic Valvulotomy, Surg., Gynec. & Obst. 84: 625, 1947.

Tuffier, T.: Etàt actuel de la chirurgie intrathoracique, Trans. Internat. Cong. Med. London 1913, Sect. 7 part 2, p. 249.

* * *

At heart, we all believe in the Healing Touch. It is no mere sentimental phrase but a powerful reality. We may not possess this gift, but we have certainly experienced it at the hands of others. How are we to define it? Something nearer magic than we are likely to admit. A sort of magnetic force in the personality which puts fear at rest, releases the restless currents of our being and harmonizes them in a new direction. Some people have it, the majority do not. This powerful human faculty is felt—in ordinary affairs, in politics, in business. But its most natural place is in the ancient art of healing, and in the medicine and surgery that have grown therefrom.

—*Williams*

II. Further Experience in the Surgical Repair of Experimentally Produced Atrial Septal Defects

Use of a New Instrument

ALDO PARENTELA, M.D.

ROME, ITALY

IN recent years considerable attention has been paid to the problem of atrial septal defects, and much effort has been directed toward the development of clinically acceptable methods for their closure.

In 1947, Cohn first demonstrated the experimental closure of artificially produced atrial defects by invaginating and suturing a portion of the right atrial wall to the edges of the defect: the stalk formed by this procedure was then severed and the defect in the atrial wall repaired.

Since then several technics have been oposed: blind or intracardiac tactile ethods were described by Murray (1948); Swan and his associates (1950); Santy and his associates (1950); Hufnagel and Gillespie (1951); Kiriluk and his associates (1951); Martin and Essex (1951); Bailey and his associates (1952); Husfeldt and Sondergaard (1952); Björk and Crafoord (1953); Schumacher (1953); Gross and his associates (1953), and Gerbode (1953).

Hypothermia (Lewis and others, 1953 and 1954; Swan and others, 1953; Bailey and others, 1954) alone or combined with extracorporal circulation, has been used in the attempt to repair atrial septal defects by open methods. Until some technical and physiologic problems in the use of both hypothermia and extracorporal circulation are solved, however, it is necessary to apply one of the closed methods.

I intend, therefore, to report further results obtained by the use of a new in-

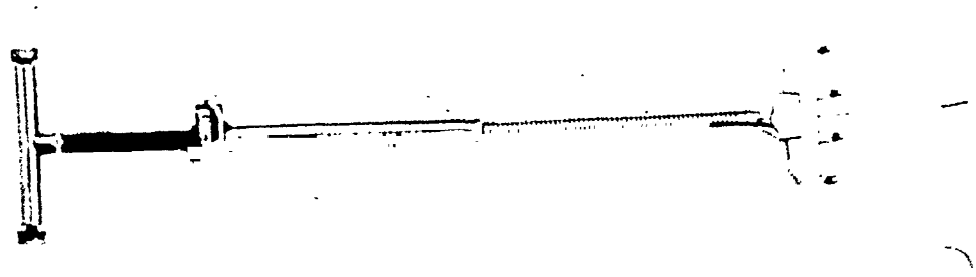


Fig. 1.—Instrument used by author (see text).

From the Surgical Clinic of the University (Head: Prof. Raffaele Paolucci di Valmaggiore), Rome.

This research has been supported by a grant from the International College of Surgeons.

Submitted for publication Sept. 15, 1955.

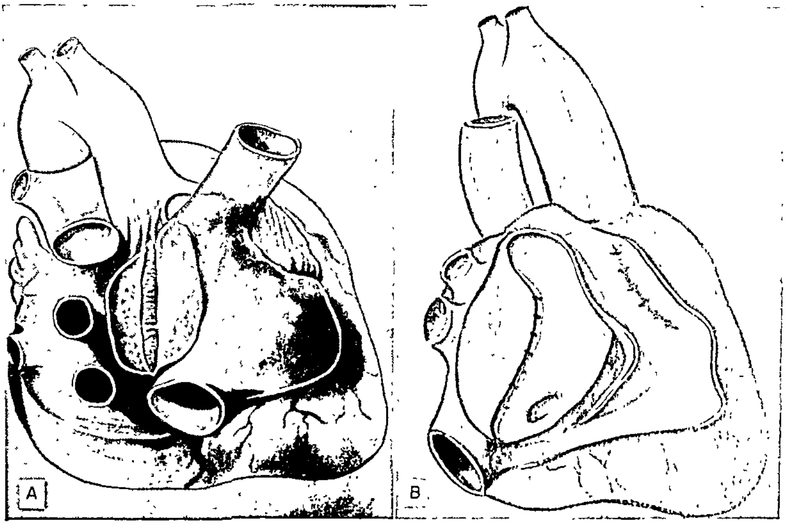


Fig. 2.—Operative technic (see text).

strument that I have described in previous papers and successively improved in the attempt to increase its efficacy, effecting the closure of large experimentally produced atrial septal defects in the dog.

The instrument consists of several parts (Fig. 1). The first is a small hook in stainless steel, whose top is provided with a T-shaped handle and which can glide into a flexible metallic sheath, remaining automatically fixed in the desired position. The sheath is provided at the inferior end with four small equidistant right-angled metallic wings. In the horizontal part of the T-shaped handle of the hook there are two small holes, one at each extremity, each provided with a small fixing screw. Finally, two other long, flexible hooks in stainless steel are available, which can be fixed to the instrument by passing them through the two small holes in the T-shaped handle of the central hook.

I have tried this instrument on 6 dogs in which large atrial septal defects had been created, applying the following operative technic. Under nembutal anesthesia the right side of the chest was entered through the bed of the sixth rib. The pericardial sac was opened wide in front of the phrenic nerve. Both superior and inferior venae cavae were clamped to interrupt the blood flow into the heart, and the wall of the right atrium was opened by an incision. The defect was created by cutting a piece of the septum that lies just at the bottom of the operative field. The atrial wall was then clamped, and a continuous suture was performed.

In the whole series, an attempt was made in each instance to create an atrial septal defect of the largest size, in which virtually no septal tissue remained; in some instances a septal rim was left. The intracardiac procedure, o de

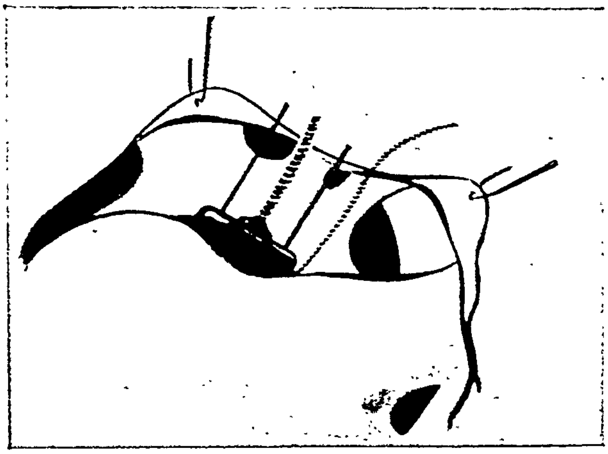


Fig. 3.—Further step in technic (see text).

direct vision, was completed in less than two minutes, most of the animals tolerated it satisfactorily, and ventricular fibrillation did not occur, as the caval clamps were released gradually; air embolization was not observed, as the heart had been filled with sodium chloride prior to release of the caval clamps.

The operative technic applied with the tent of repairing the septal defects was s follows. A groove was dissected between the two atria, starting between the superior vena cava and the right superior pulmonary vein (Fig. 2*A*), until the crossing of the muscular bundles from one auricle to the other was seen (Hanlon and Blalock, 1948; Sondergaard, 1952; Björk and Crafoord, 1953). The dissection was continued down to the inferior vena cava, with an effort to utilize as much groove as possible. The importance of this in the prevention of obstruction of the venae cavae or the pulmonary veins, once the suture is tied, has been pointed out by Björk and his associates (1954).

Once the groove was dissected, the forefinger of the left hand was introduced through the right auricular appendage to palpate the defect and the two atria. Guided by that finger, the hook was then introduced into the middle of the groove, down to the septal rim or to the upper border of the interventricular septum, which was picked up. The danger of damaging the coronary sinus or the bundle of His was very slight (Fig. 2*B*).

Immediately after the hook had been placed, the bottom of the groove was pushed down by means of the right-angled wings, and the whole instrument was fixed as soon as the atrial wall had become adherent to the septal rim (Fig. 3). A suture with three or four interrupted stitches in silk ethicon, No. 00, was performed: in most cases this was sufficient to obtain a satisfactory closure of the defect.

In 2 instances of very large defects, the forefinger introduced into the right atrium could feel, once the instrument had been fixed, that the adhesion between the atrial wall and the septal rim was not complete, particularly at the extremities. In these cases, then, one or both the supplementary hooks could be used. These were inserted through the groove, guided by the finger in the right atrium to pick up the nonadherent parts of the septum, and fixed in the T-shaped handle of the instrument. With their aid it was always possible to obtain perfect adhesion between the two parts to be sutured together. The suture could be performed easily and with highly satisfactory results. The instrument was then released and the hook, or hooks, were taken out. The forefinger of the left hand was drawn out, and the incision on the auricular appendage was repaired by continuous suture.

In 3 other dogs atrial septal defects were made by the technic described by Blalock; in these experiments, removal of the floor of the common terminal of the right anterior and cardiac pulmonary veins created a situation similar to that of atrial septal defects complicated by anomalous pulmonary venous drainage. Such defects were also closed satisfactorily by use of the aforedescribed instrument: the only difference in technic was that the instrument itself had to be applied, without dissection of any groove on the wall of the right atrium, just at the base of the pulmonary veins.

Since the results obtained in both groups of experiments were satisfactory, I should like to point out that the modifications I added to the technic first described by Gerbode — *pushing down the* atrial wall instead of picking up the septum, and the use of the new instrument aforedescribed—permit very good closure of atrial septal defects produced experimentally in the dog, even if there is abnormal venous return.

It is very important that no residual defect remain in the septum close to the valvular plane, where even a small opening would probably (Björk and others) cause a considerable shunt.

RÉSUMÉ

Cet article est une continuation d'un autre déjà publié dans ce journal sous le titre "Experimental Surgical Approach To The Aortic Valve In The Dog."

L'auteur fait ses expériments sur des chiens et il constate que les résultats dans les deux groupes ont été satisfaisants.

RIASSUNTO

Questo articolo è una continuazione di un precedente lavoro dello stesso autore sull'accesso sperimentale alla valvola aortica nel cane. I risultati delle esperienze sono stati soddisfacenti anche nel secondo gruppo di cani. Viene descritta la tecnica.

SUMÁRIO

Este artigo é continuição dox precedente, "Acesso cirurgico experimental à valvula aortica no cão," pelo mesmo outor. Novamente foram usados cães como animais de experimentação. Os resultados em dois grupos de animais foram satisfatorios. O Autor descreve sua tecnica.

BIBLIOGRAPHY

Bailey, C. P.; Cookson, B. A.; Downing, D. F., *and Neptune, W. B.: Cardiac Surgery under Hypothermia,* J. Thoracic Surg. 27:73, 1954.

Bailey, C. P.; Downing, D. F.; Geckeler, G. D.; Likoff, W.; Goldberg, H.; Scott, J. C.; Janton, O and Redondo-Ramirez, [illegible] atrial Communications [illegible] Considerations, with a [illegible] gical Technique of Atrio-Septopexy, Ann. Int *Med. 37:888, 1952.*

Björk, V. O., and Crafoord, C.: The Surgical Closure of Interauricular Septal Defects, J. Thoracic Surg. 26:390, 1953.

Björk, V. O.; Crafoord, C.; Johnson, B.; Kjellberg, S. R., and Rudhe, V.: Atrial Septal Defects: A New Surgical Approach and Diagnostic Aspects, Acta chir. Scand. 107:499 1954.

Cohn, N.: An Experimental Method for the Closure of Interauricular Septal Defects in Dogs, Am. Heart J. 33:453 1947.

Gerbode, F.: Personal communication, 1953.

Gross, R. E.; Watkins, E.; Pomeranz, A., and Goldsmith, E. I.: A Method for Surgical Closure of Interauricular Septal Defects, Surg., Gynec. & *Obst. 96,* 1953.

Hanlon, C. R., and Blalock, A.: Complete Transposition of the Aorta and the Pulmonary Artery, Ann. Surg. 127:385, 1948.

Hufnagel, C. A., and Gillespie, J. F.: Closure of Interauricular Septal Defects, Bull. Georgetown Univ. M. Center 4:137, 1951.

Husfeldt and Sondergaard: Cited by Björk and Crafoord, The Surgical Closure of Interauricular Septal Defects, J. Thoracic Surg. 26:390, 1953.

Kiriluk, L. B.; Hoag, E. W., and Merendino, K. A.: *Experimental* Interatrial Septal Defects: Physiologic Study, with Evaluation of Methods of Correction, Proc. Surg. Forum, Clin. Cong., Am. Coll. Surgeons, 1952.

Lewis, F. J., *and Taufic, M.: Closure of Atrial* Septal Defects with the Aid of Hypothermia and the Report of One Successful Case, Surgery 33: 52, 1953.

Lewis, F. J.; *Varco, R. L., and Taufic, M.:* Repair of Atrial Septal Defects in Man, under Direct Vision with the Aid of Hypothermia, Surgery 36:538, 1954.

Martin, W. B., and Essex, H. E.: Experimental Production and Closure of Atrial Septal Defects, with Observations of Physiologic Effects, Surgery 30:283, 1951.

Murray, G.: Closure of Defects in Cardiac Septa, Ann. Surg. 128:843, 1948.

Parentela, A.: Difetti settali interatriali: una nuova tecnica ed un nuovo strumento per la loro chiusura chirurgica (Note preventiva). Atti e memorie Soc. Rom. Chir. 12, page 1, 1955. Un nuovo strumento per la chiusura chiruryica di difetti creati sperimentalmente sul setto interatriale *nel cane. 50, 1955.*

Santy, P.; Bret, J., and Marion P.: Communication, interauriculaire traitee par invagination, transeptale de l'auricule gauche dans l'auricule droite, Lyon Chir. 45:359 1950.

Schumacker H. B. Jr.: Surgical Repair of Atrial Septal Defects, Ann. Surg. 138:404, 1953.

Swan, H.; Zeavin, I.; Blount, S. G. Jr., and Virtue, R. W.: Surgery by Direct Vision in the Open Heart During Hypothermia, J.A.M.A. 153: 1081, 1953.

Swan, H.; Maresh, G.; Johnson, M., and Warner, G.: The Experimental Creation and Closure of Auricular Septal Defects J. Thoracic Surg. 20:542, 1950.

◆

He [Brown-Séquard] was no longer an amateur researcher; he was now an experienced worker in physiology, burning to make discoveries, as fanatically devoted to his biological experiments as a priest to his devotions.

He tried experiments to revive the dead. The cadaver of a murderer who had suffered by Dr. Guillotin's efficient invention, was brought to the laboratory, and Brown-Séquard injected into the veins fresh blood from his own arm. Within three-quarters of an hour the phenomena of life seemed to return to the dead body. Muscles flickered and certain tissues showed signs of vitality, proving that when we die, all the organs do not die at once, but that some remain alive for hours and perhaps longer. Even death, it seemed, was not so simple a process as had been believed. What a theme for physiology, to revive the dead, to bring back movement and function to living things by reversing the apparently irreversible processes of decay. The corpse of the murderer lay still, but the light of life flickered in Brown-Séquard's brain, and he was sure there were no limits to the achievements of the physiological method. He had shown certainly that the grim transition between life and nothingness was not an abrupt change as humans had always believed, but a series of small deaths, like lamps going out one by one. He could not arrest the process, though he could study it, and he concluded that before he might bring the dead back to life he must know more about the body when it was living. Brown-Séquard moved to another field and this idea of resuscitating the dead itself remained dead for nearly a hundred years, when Soviet scientists revived it, and carried experiments even further, but without yet reaching the final secret.

—*Williams*

Definitive Bracing in the Treatment of Cerebral Spastic Paralysis of the Extremities

SIDNEY KEATS, M.D., F.I.C.S., D.A.B.
ORANGE, NEW JERSEY

IN the treatment of spastic paralysis of the extremities the main objective in the use of braces is to prevent or correct deformity. This is in some contrast to the purpose of bracing in cases of the residual paralysis of poliomyelitis, in which braces are used chiefly for support in substitution for the paralyzed muscles, or for limiting joint function, as in the presence of foot drop. In the treatment of clinical types of cerebral palsy other than the cerebral spastic, particularly the athetoid, braces are used not only for support but for the direct control of coordinated joint movement and the elimination of involuntary motion.[1]

By far the most common deformity associated with the spastic extremity is pes equinus. The wearing of braces at night has become almost a routine practice of patients in this clinic, not only for prevention of equinus but for the stretching out of contractures of the achilles tendon and muscle sheath caused by spasticity of the gastrocnemius soleus group of muscles. Operations for the lengthening of contracted heel cords can often be avoided by early and persistent application of a foot brace at night. No amount of stretching of the heel cord by a therapist or a parent can compare in effectiveness to the stretching obtained by the wearing of a foot brace during the long hours the child spends in bed. Then again, any benefits obtained from manual stretching of the heel cord, or even from the wearing of a drop-foot brace during the day, are nullified when the child sleeps in the prone position at night, since this position forces the foot into further equinus and allows the heel cord to contract. Quite frequently after wearing the foot brace at night, the child with contracture of the heel cords due to spasticity of the calf muscles, will be able to discard the braces during the day.

The night brace used for this purpose, as suggested by Phelps,[2] consists of a properly fitted high-quarter shoe that laces above the ankles, to which is attached a single bar caliper with a well-padded leather cuff below the knee and a right angle ankle stop fixed to the sole of

---

From the Cerebral Palsy Clinic and Treatment Center, New Jersey Orthopedic Hospital, Hospital Center, Orange.

Submitted for publication Sept. 5, 1955.

the shoe. The caliper bar is a stout round bar that can be bent with brace irons as the heel cord stretches out and the foot comes up into greater dorsiflexion. At intervals, as the foot comes up into further flexion, the slack can be taken up by simply bending the round caliper bar with irons. In the application of this brace, it is important that the shoe be put on first and laced snugly above the ankle, so that the heel will not slip when the caliper bar and cuff are fastened. The oxford type of shoe should not be used, because the heel will slip out when the bar is applied. It is suggested that the toe-cap of the shoe be removed to insure that the toes, which may be under the influence of spastic flexor muscles, are not curled up under the foot. The foot brace is worn every night until full longitudinal growth of the tibia has taken place (usually at about the age of 16), because, as long as the tibia continues to grow in length, contracture of the heel cord may recur, since it is growth that creates a bowstring action in the gastrocnemius-soleus muscle and its motor arm, the achilles tendon. In the presence of varus deformity associated with equinus the caliper bar is applied on the medial aspect of the shoe, and an outside or lateral T strap is attached. This strap passes over the bar and pulls the foot toward the bar, correcting the varus deformity. If there are severe equinovarus deformities of the foot the varus deformity should be corrected first, as in the correction of clubfoot before one undertakes to obtain dorsiflexion of the foot by stretching the heel cord. The majority of equinus deformities, however, is associated with valgus. In this instance the caliper bar is placed on the lateral aspect of the shoe, and the T strap is fixed to the medial aspect. The results obtained with this type of treatment of equinus deformity associated with spastic paralysis of the foot have been most impressive in the correction of current deformity and equally decisive in the prevention of fixed equinus deformity. This simple night brace has precluded many operations for lengthening the heel cord. In addition, it has been my impression that, by persistent stretching of the heel cord with this brace, excessive shortening of the affected leg can be avoided through elimination of the bowstring action of the achilles tendon during the more rapid longitudinal growth of the tibia.

This brace can be recommended, too, for postoperative use after surgical lengthening of the heel cord.[3] It is a necessary safeguard, because the spasticity of these muscles is not diminished through lengthening the attached tendon, and recurrence of the contracture is therefore frequent. It can be avoided by the postoperative application of this simple foot brace at night.

Occasionally, contracture of the heel cord, due to marked spasticity of the gastrocnemius muscle (rather than the soleus), which resists correction by the short leg brace, will require a long leg brace with a double caliper bar. This brace, which maintains the knee in full extension and the foot in dorsiflexion, is applied at night. For children who cannot tolerate full extension of the knee at night it is utilized as a day brace. The stand-up table is a valuable aid in making these braces more acceptable, both in school and at home. The child wearing long leg braces in full extension at the knees, is placed in the stand-up table, where he can work with his hands, read, or otherwise be comfortably occupied. It is obviously impossible for a child to sit comfortably for any length of time with the knees locked in full extension.

Overactivity of spastic gracilis muscles, resulting in knee flexion and adduction contractures, is corrected by the use of long leg braces and a spreader bar. The spreader bar may be attached either above or below the knees, but the knees must be locked in full extension.

The treatment of adduction contractures of the legs requires careful application of braces. Before braces are prescribed, a precise analysis of the cause of the adduction contracture or the scissors gait is advisable. The scissors gait in the child with cerebral spastic paralysis is frequently due to spasticity of the adductor muscles. Careful testing of the muscles, however, will demonstrate in many instances that the scissors action is due to spasticity of the flexors and internal rotators of the hips. These muscles are very close in action, and, although the patient is able to stand easily with the legs abducted, any attempt to flex the hips will cause internal rotation of the legs at the hips. When the adduction contracture or scissors gait can be attributed solely to spasticity of the adductor muscles, long leg braces, with the knees in full extension and an adjustable spreader bar above them, as aforedescribed, may be utilized. On the other hand, when there is marked overactivity of the hip flexors and internal rotators, it becomes necessary to attach the long leg braces to a pelvic band. Ball-bearing hip joints are then used to neutralize the thrust of the scissors action. In general, for training a child to walk in the presence of scissors action or adduction contracture, long leg braces with a pelvic band are utilized. Occasionally, when the internal rotation is not too severe, the pelvic band may be omitted; in its place, a posterior rotator strap is attached to upright extensions on the lateral bars of the leg braces.

For patients with milder degrees of internal or external rotation of the legs, due not to spasticity of the rotator muscles of the hips but to imbalance of "zero" cerebral or weak antagonist muscles, elastic straps, or "twisters," may be used. These appliances are used only for gait training. They are attached to a canvas belt worn about the waist and are twisted about the legs, terminating in buckles on the shoes. It must be emphasized that "twisters" should not be used in the presence of spastic hip rotators, since the elasticity of the straps will initiate stretch reflexes in the spastic muscles and increase the overactivity of these muscles rather than help to correct the deformity. These straps, too, are contraindicated when there is a tendency toward flexion of the knees.

SUMMARY

1. In the treatment of cerebral spastic paralysis of the extremities, braces are recommended for the prevention and correction of deformity.

2. The most frequent deformity associated with the spastic extremity is pes equinus, due to contracture of the achilles tendon.

3. A foot brace, worn at night, is recommended to stretch the contracted heel cord and to prevent deformity of the foot. This brace consists of a shoe, laced above the ankle, to which is attached a single round bar with a cuff below the knee joint, and a right-angled posterior ankle stop. This brace is recommended for postoperative use after surgical lengthening of the heel cord.

4. Definitive bracing for the overactivity of spastic gracilis muscles, adductor muscles, and flexor-internal rotator muscles of the hips is described. The rationale for this bracing is based on a careful analysis of the muscles involved in the production of the motor imbalance or the contracture.

RÉSUMÉ

1. Dans le traitement de la paralyse des extrémités on recommande l'application des freins pour prévenir et corriger une déformité.

2. La déformité qu'on le plus fréquemment associe avec l'extrémité spastique est

le pes equinus par conséquence d'une contracture du tendon d'Achille.

3. Un frein fort qui serait porté pendant la nuit est recommandé pour étendre la chorde contractée du talon et pour prévenir une déformité du pied. Cet appareil se compose d'un soulier, lacé au dessus de l'articulation du pied, auquel un seule tige ronde est attachée avec une manchette en dessous du genou et un arrêt rectangulaire posterieur du talon. Cet appareil est recommandé pour usage apres l'allongement chirurgical de la chorde du talon.

4. Un frein définitif est décrite contre la superactivité du gracilis, des muscles adducteurs et des flexeurs—internal rotateurs de la hanche. La raison de ce frein est basée sur une analyse exacte des muscles qui prennent part au dérangement de l'équilibre motorique ou à la contracture.

ZUSAMMENFASSUNG

1. In der Behandlung zerebraler spastischer Lähmungen der Gliedmassen werden Schienen zur Verhütung und Verbesserung von Entstellungen empfohlen.

2. Die häufigste durch spastische Lähmung einer Extremität entstehende Entstellung ist der Klumpfuss als Folge einer Kontraktur der Achillessehne.

3. Zur Streckung der kontrahierten Sehne und zur Vorbeugung einer Entstellung des Fusses wird eine während der Nacht zu tragende Fusschiene empfohlen. Diese besteht aus einem oberhalb des Fussgelenks geschnürten Schuhs, an dem eine einzige runde Stange mit einer Manchette unterhalb des Kniegelenks befestigt ist, und der mit einer rechtwinkligen das Fussgelenk fixierenden Schiene an der Hinterfläche versehen ist. Dieser Apparat wird zur Anwendung im Anschluss an die chirurgische Verlängerung der Sehne empfohlen.

4. Bestimmte Schienen zur Behandlung der Überaktivität des spastischen M. gracilis, spastischer Adduktoren und spastischer Beuger und Innenrotatoren der Hüfte werden beschrieben. Die Überlegungen, die solchen Schienungen zugrunde liegen, beruhen auf einem sorgfältigen Studium der Muskeln und ihres Anteils am Zustandekommen motorischer Instabilität oder von Kontrakturen.

RIASSUNTO

1. Nella cura della paralisi cerebrale spastica delle estremità viene raccomandato l'uso delle calzature ortopediche per prevenire e correggere le deformità.

2. La deformità più frequente a riscontrarsi è il piede equino, che è dovuto alla contrattura del tendine di Achille.

3. La calzatura ortopedica, indossata durante la notte, mantiene in tensione il tendine e impedisce la deformià. Essa consiste in una scarpa allacciata alla caviglia, a cui è attaccata una sbarra che termina in una cuffia al di sotto del ginocchio. Essa può essere usata anche dopo gli interventi chirurgici correttivi.

4. Viene descritto anche un metodo per correggere lo spasmo del muscolo gracile, degli adduttori e dei flessori dell'anca. Esso è basato su uno studio accurato della attività dei vari muscoli interessati.

SUMÁRIO

1. No tratamento da paralisia cerebral espastica das extremidades, são recomendados suspensorios para a profilaxia e correção da deformidade.

2. A deformidade mais frequentmente associada à extremidade espastica é o pé equino, devido à contratura do tendão de Aquilles.

3. Um suspensorio para o pé, usado à noite, é recomendado, para distender o tendão de Aquilles e evitar a deformidade do pé. Tal suspensorio consiste em um sapato, amarrado acima do tornozelo, ao qual é amarrado uma barra unica arredondada com um manguito abaixo do joelho.

Este suspensorio é recomendado para uso pos-operatorio, após o alongamento cirurgico do tendão.

4. É descrita a conduta com relação à super-atividade dos musculos gracilis, adutores e rotadores flexores internos da articulação coxofemural, após analise cuidadosa dos musculos comprometidos na produção do desequilibrio motor ou da contratura.

REFERENCES

1. Keats, S.: The Use of Braces in the Training of the (Cerebral Palsied) Athetoid Child, J. M. Soc. New Jersey 52:254 (May) 1955.
2. Phelps, W. M.: Personal communication.
3. Keats, S.: Surgery of the Extremities in Cerebral Spastic Disorders, J. Med. Soc. New Jersey 45:491, 57 (Feb.) 1951.

◆

The fight for freedom is not to be won by any mere change in our economic system. It is to be won only by a constant resistance to the tyranny of officials, and a constant realization that mental freedom is the most precious of all goods. Mechanism has its place. Its place is in the material side of life, the provision of the food and clothes and houses without which we cannot live. But it has no place in what makes life worth preserving, in art and thought, in friendship and love, or in simple enjoyment.

The greatest possible amount of free development of individuals is, to my mind, the goal at which a social system ought to aim. To secure this end, we need a compromise between justice and freedom: justice, to secure opportunity and the necessaries of life for all; freedom as to the use made of opportunity, so long as that use does not infringe justice. Justice and freedom have different spheres; the sphere of justice is the external conditions of a good life; the sphere of freedom is the personal pursuit of happiness or whatever constitutes the individual's conception of well-being.

—*Russell*

Obstetric and Gynecologic Surgery

Problems of Obstetrics and Gynecology in Relation to Infection of the Urinary Tract

GILBERT F. DOUGLAS, M.D., F.A.C.S., F.I.C.S., D.A.B.*
GEORGE C. DOUGLAS, B.S., M.D.**
WILLIAM W. DOUGLAS, B.S., M.S., M.D.†
GILBERT F. DOUGLAS, JR., B.S., M.D.‡
SARAH FRANCES DOUGLAS, B.S., B.A., M.S., M.T.§
BIRMINGHAM, ALABAMA

IN a paper of this kind there are many factors to be considered. It is rather difficult to emphasize the most important ones in the space available. Female urologic, gynecologic and obstetric conditions are so intimately related that there is no separating them logically in making a diagnosis.

Clinical observations have aroused the suspicion that infections of the urinary tract in mothers may be the source of infection in the newborn. This hypothesis was supported by observations made in an early study, in which it was reported that manipulation in the course of delivery seemed to have caused infection in the newborn. The diagnosis of infection of the urinary tract may be made by examination of smears prepared from sediments from the urine. Gram's method may be used for staining. The pathogenicity of the bacteria possibly involved varies greatly; it is mandatory, therefore, that some idea of the nature of these organisms be obtained.

Complications to be looked for are as follows:

1. Internal infection—infection in the respiratory or the gastrointestinal tract.
2. External infection—localized to the skin and also to the navel and the eyes.
3. General symptoms—including vomiting and elevation of temperature for no less than two days.

Some authors have stated that the frequency of infection is highest in the newborn[1] (mortality rate, 20 per cent).

In one of our recent cases the patient after about eight months pregnancy was delivered of twins. The membranes ruptured about six hours before the first baby was born. This was a head presentation, and delivery was accomplished without

---

*Associate Professor of Gynecology, Medical College of Alabama.

**Senior Resident in Obstetrics and Gynecology, Medical College of Alabama and Jefferson-Hillman Hospital.

†First Lieutenant, U. S. Air Force Medical Corps.

‡Assistant Professor of Clinical Medicine, Department of Medicine, Medical College of Alabama.

§Head Technician, Douglas Clinic.

Presented at the Eastern Division Regional Meeting, International College of Surgeons, Cape Cod, Chatham, Massachusetts, Saturday July 2, 1955.
Submitted for publication July 2, 1955.

undue trouble. The second baby was born about thirty minutes after the first and was in a separate bag or sac. The membranes did not rupture until the baby was presenting to the surface of the vulva, and it was easily delivered by breech extraction. Both babies seemed normal until the second day, when the first baby, a girl who had weighed 4 pounds 11 ounces (2,626.2 Gm.) at birth, began to vomit and became jaundiced; fever set in, and she died less than forty-eight hours after birth. The second baby, a boy weighing 5 pounds 6 ounces (2482.5 Gm.) at birth, seemed perfectly well until the third day, when similar symptoms developed. He died within six hours after the onset of symptoms and less than sixty hours after birth. On blood culture from the two babies the same organism was grown, which was reported as Aerobacter aerogenes in an almost solid field. The particular point of interest in this case was the fact that the membranes of the first baby ruptured about six hours prematurely; the second baby was in a separate sac, and the membranes did not rupture until the breech was presenting at the vulva. The same organisms were grown in the two instances. It raised the question rather forcibly, whether intrauterine infection with this bacillus can occur. The mother had no symptoms and no trouble before or after delivery. I saw her in the office within an hour and half before the first membranes ruptured, and at that time she was feeling perfectly well.

Chronic urethritis is thought to be a factor contributing to infections related to pregnancy. Many authors of urologic textbooks do not even mention the existence of chronic urethritis, which is probably much more frequent than it is thought to be. Some authors state that urethritis in girls has been recognized as one of the most common causes of complaints referable to the urinary tract in pediatric urology.

The subjective and objective picture and the symptoms of urethritis are well known; urgency, dysuria, nocturia, and diurnal frequency of urination are the most characteristic complaints. Hematuria and obstructive symptoms are unusual but may occur.

In many cases of vaginal infection the secretions do not invade the urethra. The labia have varying degrees of irritation and redness, which frequently extend to the inner aspect of the thigh. Urine cultures may be sterile but they often contain the bacterial offenders ordinarily associated with infections of the urinary tract—especially Escherchia coli, Bacillus proteus, and beta hemolytic Staphylococcus aureus. Elimination of the pyuria should be done as quickly and as thoroughly as possible. Urethritis should be treated and vaginitis controlled not only in the gynecologic patient but as far as possible in the obstetric patient before delivery. This is frequently accomplished by the use of sulfonamide preparations or such antibiotics as aureomycin or terramycin. Penicillin or streptomycin is not necessary in every case.

Urethral dilation for urethritis initiated while the patient is under anesthesia for cystoscopic procedures, may aid greatly in clearing the urethritis.

As has been stated, control of vaginitis by local treatment is absolutely essential to the prevention of relapse and recurrence.[2]

The closely related embryonic and anatomic development of the urinary and genital organs is responsible for the reciprocal manifestations often exhibited between the two systems. The intimate anatomic relation between the genital apparatus and the lower part of the urinary tract predisposes to harmful effects in one when abnormal processes are present in the other.

1. Innervation

rived from ganglia along the aortic and celiac plexuses, from the hypogastric nerve trunk and from the pelvic plexus.

2. The left ovarian vein empties into the left renal vein, and both ovarian veins have direct branches from the ureters.
3. The internal genitourinary organs (bladder, uterus, tubes and ovaries) drain into the lymph glands along the floor of the pelvis.

Pregnancy may have a marked effect upon the ureters and kidneys. Proper treatment for disease in one system may have a serious side-effect on the other.

Infection often initiates such symptoms as (1) steady pain in the lower part of the vagina and (2) dyspareunia. The classic symptoms of vesical inflammation — frequency, burning or pain on urination, and suprapubic pain — usually lead the physician to the proper diagnosis. Occasionally the atonic neurogenic bladder is encountered and mistakes in diagnoses are made and radical treatment carried out.

The "honeymoon bladder" is always to be thought of. Ectopic kidney should not be overlooked. The effects of pregnancy on the urinary system, as well as the marked changes that occur during pregnancy and the puerperium, are well known. It is estimated that over 80 per cent of pregnant women will show dilatation of the ureters, usually more marked on the right. The dextrorotation of the uterus would cause more pressure on the right ureter; the sigmoid colon would have a tendency to protect the left ureter.[3]

Although urologic indications for therapeutic abortion may exist, the genitourinary system, with the possible exception of the cardiovascular system, consists of the most vulnerable of all to the possible deleterious effects of pregnancy.

In the urologic assessment of the ability of a patient to undergo pregnancy, the following points are of major importance:

1. Albuminuria. If it is present, a quantitative determination should be made.
2. Concentration of urine. The specific gravity should be 1.025 or higher.
3. Intravenous pyelographic picture. This is important for visual detection of kinking, obstructions, recurrent tumors, etc.
4. Urea clearance. Less importance, probably, is placed on this than formerly.
5. Retrograde pyelographic and cystoscopic pictures. These studies are utilized when indicated, but should not be done routinely; however, there are very few complications associated with them if properly done.

Indications for therapeutic abortion are as follows:

1. Renal tuberculosis of any degree of activity.
2. Genitourinary malignant disease. The high incidence of recurrence plus the physiologic changes induced in the urinary tract by pregnancy makes continuation of the latter especially hazardous.
3. Congenital polycystic disease. The bilaterality of this condition usually contraindicates the added strain of pregnancy.
4. Hypertensive cardiovascular renal disease.
5. Chronic nephritis, in which permanent renal damage has been sustained as the result of acute infection. This should always be considered, for in some cases proper evaluation may enable the patient to go to term.[5]

No discussion of the relation of chronic cervicitis to infection of the urinary tract can ignore the treatment of existing granular urethritis and polypoid excrescences. Fulgeration, dilation, and silver nitrate may relieve many patients of their symptoms. Clinical observation often suggests that in many instances the primary etiologic factor is some gynecologic disease. Sturmdorf and others have emphasized the importance of the cervix as a chronic focus of infection for systemic disease.

Chronic cervicitis near the base of the bladder is intimately connected to the anterior surface of the supravaginal portion of the cervix and to the area above as far as the internal os. This area is near the anterior portion of the base of the broad ligament or parametrium. In this area, between the peritoneum and the pelvic fascia, are incorporated the uteropubic ligament, an abundance of loose areolar connective tissue, smooth muscle fibers, a rich network of lymphatics and the blood supply. This is spoken of as the "weak spot."

White has fully demonstrated, experimentally, by injection of India ink as well as living and dead tubercle bacilli into the cervices of guinea pigs and rabbits, that a lymphatic connection exists not only between the bladder and the cervix but between the cervix and the vagina.

In experimental work, Maryan, after grinding, under aseptic technic, cervical tissue enucleated by Sturmforf's method of conization with the high frequency cutting current scalpel, isolated the heat-resistant enterococcus from the depths of the compound racemose glands in 80.4 per cent of the specimens.

Lesions of the cervix may be classified as follows:

1. Congenital erosion. This is encountered in virgins and young girls.
2. Ectropion or eversion of the cervical lips. This is not a true erosion but a bulging forward of the velvety red endocervical mucous membrane.
3. Simple erosion. This represents replacement of the stratified squamous epithelium of the cervical lips by high cylindric epithelium.
4. Follicular erosion which is characterized by the presence of retention cysts, the so-called Nabothian follicles or cysts.
5. Papillary erosion, manifested grossly by velvety red elevations on the surface of the cervical lips.
6. The healing of erosions, or replacement of the glandular misplaced epithelium with stratified squamous epithelium.

Such lesions as syphilis, tuberculosis, early carcinoma and pinpoint leukoplakia should be ruled out before coagulation. Coagulation should never be done in the presence of an acute or subacute inflammatory lesion of the internal or external organs.

Urinary infections are frequent and often serious complications of gynecologic and obstetric conditions. The etiologic agent may be any one of a variety of microorganisms, but in the majority of cases some member of the coliform group of bacilli is the responsible agent.

With regard to cure, the following suggestions are made:

1. Elimination of the source of infection from the bowel for three weeks may give the tissues of the urinary tract time to recover sufficient natural resistance to infection to protect them against recurrence.
2. The beneficial effect exerted by the sulfa drug upon the intestinal tract may decrease the avenues for escape of organisms into the blood stream or the lymphatic channels, through which they may have been reaching the urinary tract.
3. There may be certain strains of E. coli with a selective affinity for the urinary tract which are completely and permanently eradicated as a result of administration [illegible] the [illegible] drug.[6]

Bacteria observed in the urine may represent an original invasion in the course of pregnancy or the quiescent stage of a previous infection. Primiparae are much more likely to become infected than are multiparae. It should be remembered that, although while these patients may become asymptomatic, it is not proof that the infection in the urinary tract has been eradicated.[7]

Stasis in the urinary tract during pregnancy favors the development of pyelonephritis. The most frequent locations or obstruction are (1) the ureteropelvic juncture, (2) the point of crossing of the ovarian vessels and (3) the pelvic brim. The ureteral wall shows effects of atony, dilatation, stasis and dilatability. There may be hypertrophy of Waldeyer's sheath; the terminal and intramural portions of the ureter may be displaced laterally. Periureteritis frequently occurs, causing matting of the loops and kinking. This follows infection, which may be confined to the mucosa and submucosa of the ureter and pelvis, but the sponginess of the walls permits extension through all layers.

The treatment is prophylactic and should be done during pregnancy. Careful inquiry as to symptoms referable to the urinary tract should be made at each antepartum visit. Trauma is most marked about the trigone and the adjacent bladder base. Rupture of the bladder usually occurs in the trigone. The bladder neck may be displaced from the symphysis; there may be urethral trauma and paraurethral lacerations. Catheterization by the clock is unreliable, for the bladder of one patient will fill much more rapidly than that of another.

An incarcerated uterus presses the cervix and adjacent anterior wall against the base and neck of the bladder.

Chronic pyelonephritis and hydronephrosis may develop. Factors modifying the pyelitis of pregnancy, with the cortex irregularly involved in pyelonephritis, are stasis allowing concentration of drugs and prolonged contact of drugs with tissues. Infection increases the degree of dilatation, and the time required for the appearance of dyes. Types of diseases are (1) parenchymatous, (2) pelvic and (3) combined.

In studying the urinary tract, the ureters in pregnancy might be studied in trimesters. The greatest atony is present from the fifth to the seventh month.

Renal tuberculosis and pregnancy—genitourinary tuberculosis—is adversely affected by pregnancy because of the impairment of drainage and the frequency of pyelonephritis due to pyogenic organisms.

The physiologic changes of pregnancy superimpose themselves on all the anomalies of position, number, form, blood supply and structure. Severe pyelonephritis almost invariably develops in polycystic kidneys during pregnancy. For this reason, physiologically speaking, pregnancy is rather a serious condition for a woman with polycystic kidneys.[8]

Chronic nonspecific urethritis is not completely understood. Any condition that reduces the resistance of the urethral mucosa to disease may initiate the pathologic changes that result in chronic urethritis. It is estimated that over 95 per cent of patients with this disease are married, which suggests that the trauma of intercourse is an etiologic factor.

Treatment of nonspecific urethritis involves three simple procedures: (1) irrigation and distention of the bladder with a bland antiseptic solution; (2) dilation of the urethra, and (3) instillation of silver nitrate solution into the urethra.

One author states that conservative treatment to the urethra, consisting of these three therapeutic measures, produced complete relief of dyspareunia in 13 patients and definite improvement in 10.[9]

It has been stated that the most frequent urologic complication of pregnancy is acute pyelonephritis. Some of the normal anatomic and physiologic changes that occur are looseness of structures in the urinary tract, with wide separations in the fibers of the muscular coats of the urinary organs; widening of the submucosal layers, and increased thickness of walls or channels out of proportion to the evidence of hyperplasia.

It has been stated that the second most important factor in the production of acute pyelonephritis is the pressure of the pregnant uterus against the brim of the pelvis. This pressure obstructs the outflow of urine from the upper channels.

The diagnosis is based on a history of chills, fever, sweats, pain in the renal area on one or both sides, fever and the presence of pus and bacteria in a catheterized bladder specimen.

The pyelonephritis of pregnancy is a preventable disease; therefore, prevention is of the greatest importance. All foci of infection should be removed, and proper bowel management must be instituted.[10]

The bladder, because of its position in the bony pelvis and its proximity to the enlarging uterus, is usually compressed in the anteroposterior diameter, and the cystic organs reveal the usual saddle-shaped deformity.

The clinical incidence of pyelonephritis in pregnancy is 1 to 3 per cent, according to various observers.[11]

In our discussion of the urologic aspects of gynecology during the past quarter of a century, much emphasis has been placed upon the desirability of training the gynecologist in the fundamental principles of obstetrics. It is no less important for the well-trained gynecologist to be grounded in the gynecologic and obstetric aspects of urology.[12]

Infection of the urinary tract is usually referred to as pyelitis. When renal infection appears during or after delivery, it is usually the result of renal stasis, apparently of the ascending type rather than the hematogenic. In former years the pyelitis of pregnancy was recognized by symptoms such as urinary frequency and dysuria or as malaise and fever. Pyelitis causes much concern, because it often remains undiscovered until extensive renal damage has taken place. If urinary infection is present, the physician, in order to administer proper treatment, should have at least a superficial knowledge of the invading bacteria. Such knowledge can be obtained easily by Gram's method of staining the dried urinary sediment. Whether the bacilli or cocci are gram-positive or gram-negative makes considerable difference in the type of treatment indicated. Infection with colon bacilli, when detected early, usually responds readily to chemotherapy.

If pyuria fails to clear up after treatment with forced fluids or chemotherapy, the presence of some complication must be suspected.[13]

In one group treated with aureomycin,[14] the antibiotic was provided as a powder in capsules, each containing 50 mg., and given by mouth. The most common complaint was of looseness of the bowels with frequent (2 to 4 daily), bulky, soft stools, but no true diarrhea. Some patients with cystitis complained of a disagreeable sensation as of something "drawing" or "squirming" in the pelvis.

In the last fifteen years rapid strides have been made in the field of chemotherapeutics and antibiotics, so that today much more aid can be offered to the patient suffering with urinary infection.[15]

Many chemical compounds have been used for the eradication of infections of the urinary tract.

1. The sulfonamide drugs are effective against a greater variety of organisms than are most others.

2. They are attended by fewer unpleasant side effects than are most of the antibiotics, especially those administered orally.
3. An antibiotic is likely to be entirely ineffective if used before the results of culture have been reported. Each of the antibiotics is completely ineffective against some of the organisms that cause urinary infection.
4. The sulfonamides are less costly than the other drugs available.

Some of the types of urinary tract infection are as follows:

1. Acute cystitis, the commonest form encountered in gynecologic patients. In a single attack or in several attacks at long intervals, it probably does not indicate organic urologic disease.
2. Frequently recurring attacks of acute cystitis or chronic cystitis. These should lead to complete urologic investigation.
3. Simple forms of urinary infection. These can usually be successfully treated by sulfonamide therapy. Antibiotic therapy should be reserved for the more complicated and serious infections or those that have proved resistant to sulfonamide therapy. Antibiotic therapy is likely to prove more effective if the antibiotic is selected by means of sensitivity tests performed on the offending organism in each individual case.[16]

An antibiotic treatment that is based solely on the identification of the bacteria is irrational, as experience shows that a bacterial strain may change its sensitivity. In a study made by Halkier and others it is stated that with every sensitivity test the bacteria have been classified simultaneously.

The authors state that there should be (1) no irrational treatment, i.e., no antibiotic therapy without a sensitivity test; (2) instigation of treatment at the optimal time, probably two days prior to operation, and (3) as little intraurethral interference as possible. They avoid use of the indwelling catheter when feasible.[17]

It is obvious that if infection is due to any of the coliform or other gram-negative bacilli, the use of penicillin is valueless and subjects the patient to the risk of sensitivity reactions, thus preventing its subsequent use. Bacterial resistance of "fastness" has become a serious problem since the new agent has been generally available.

Clinical differentiation between acute infection, chronic infection and chronic infection with acute exacerbation gives important evidence as to the probable value of chemotherapy. Generally, in the presence of pure gram-positive coccal forms, penicillin is the drug of choice; for mixed infections a combination is indicated.

Infections of the bladder should be classified as to acuteness or chronicity before chemotherapy is considered. A high percentage of these infections will reveal only gram-negative rods in the stained urinary sediment. Chronic infections, on the other hand, if uncomplicated, are generally due to bacteria which have developed resistance to a chemotherapeutic agent formerly used.

Tuberculosis of the urinary tract is still, in most instances, a surgical problem, and streptomycin is used only for selected types of infection or as an adjuvant measure, preoperatively or postoperatively.

There have been "pellagra-like" reactions to chloromycetin, with glossitis and stomatitis. Vitamin B complex should be administered concurrently until further explanation of this side reaction is obtained.[18]

1. Dilatation of one or both ureters is present in most pregnant women

and is most marked and most common on the right side.

2. The dilatation involves the abdominal portion of the ureter. It is greatest at about the seventh month and diminishes near term.
3. Marked tortuosity and apparent elongation of the ureter is a common observation during pregnancy.
4. Obstruction of the ureter, delays in excretion and decrease in the urinary system may occur even though there is no history of disease of the urinary tract prior to the current pregnancy.
5. Lateral displacement may occur, especially on the right side.
6. Changes in the urinary tract may occur but are usually asymptomatic.
7. Acute infection may become superimposed upon the urinary system, even though there is no history of disease of the urinary tract prior to the current pregnancy.
8. Involution occurs following delivery but is delayed if infection has been present.[19]

These conditions have been thought to be due largely to pressure from the pregnant uterus; a few have expressed the opinion that some other factor is involved.

Some authors have stated that the position of the fetus has no bearing upon the dilatation observed, owing to its frequent change of position. In their opinion, the trigone reveals definite hypertrophy of the muscle layers, associated with edema and increased vascularity.[20]

Streptomycin has a supposed specific action on certain organisms; it is contraindicated in pregnancy, however, because of possible injury to the auditory and vestibular nerves. It is necessary to find a compound that will cure urinary infection of E. coli in both acute and chronic infections and which will be sufficiently nontoxic to allow its use in the treatment of patients with impaired renal function, severe anemias, pregnancy, etc.[21]

In the discussion of major infections the fundamental lesions might be listed as: (1) obstruction; (2) tuberculosis; (3) *tumor;* (4) *foreign body (especially calculi)*, and (5) fistula.[22]

Chronic pyelonephritis may cause few if any objective symptoms during the entire period of gestation, but it may flare up at any time in an acute attack. Cystoscopic drainage of the kidney by ureteral catheterization produces spectacular results in cases of ureteral obstruction, high temperature, chills, etc.

For years the problem of the toxemias of pregnancy has been rendered obscure by multiple classifications and confusing terminology. McCaffery and Hess expressed the opinion that these toxemias should be classified as vasculorenal disturbances marked by hypertension, albuminuria and edema, with gradual suppression of urine, and that they should all be regarded as the same pathologic entity.

There are four possible stages of toxemia: (1) the mild toxemia of early pregnancy, manifested by nausea and vomiting; (2) toxemia with mild hypertension and slight albuminuria; (3) so-called preeclamptic toxemia, with a little more hypertension, some albuminuria and some edema, and (4) the eclamptic or terminal stage, *manifested by hypertension, scanty* urine, massive albuminuria, edema and convulsions.[23]

Obstruction in the urinary tract is a most important cause of persistent or recurrent infection. It occurs in children and in women and may be treated by dilation with the use of sounds, or by endoscopic resection of fibrous or redundant tissue at the vesical neck.

Hydronephrosis is often caused by narrowing of the ureteropelvic juncture or by obstruction along the course of the ureter. Diagnosis is [illegible] urographic study, ureteral catheterization, and retrograde pyelographic study.[24]

In discussing urinary antiseptics, O'Connor stated that there are only two periods in medical treatment of infection of the urinary tract. He used the terms as "B.B.C." (before bacterial cultures) and "A.B.C." (after bacterial cultures). He stated that the first antiseptic of any real germicidal value was hexamethylenamine. Urotropin, uritone, etc., are among the many trade names given to methenamine. Several of the "wonder drugs" are sulfanilamide, penicillin, streptomycin, aureomycin, chloromycetin and terramycin.

Antibiotics derived from bacteria have important, although limited, uses in the treatment of urinary tract infections.[25]

In the beginning of the third trimester of pregnancy one usually observes the maximum degree of change in the upper part of the urinary tract. Cystoscopic observations of the ureteral orifices during pregnancy tend to confirm the idea of atonicity. Feeble spurts of urine, with only minor contractions of the ureteral orifices, can often be noted. Temporary hydroureter (upper two-thirds) and hydronephrosis are produced on either one or both sides, probably as the result of hormonal activity producing atonicity of the ureters and the renal pelvis, which is accentuated by the mechanical obstruction of an enlarged uterus.[26]

The urologic complications of pregnancy may be summarized thus:

1. Complications based on physiologic changes
    a. Atony of the urinary tract
    b. Cystitis
    c. Pyelitis
    d. Bacteriuria
2. Diseases complicated by pregnancy
    a. Acute nephritis
    b. Chronic nephritis
    c. Calculus
    d. Malformations
    e. Tuberculosis
3. Complications based on anatomic changes
    a. Ischuria due to incarceration of the retroverted pregnant uterus
    b. Dietl's crisis
    c. Vesicovaginal fistula.[27]

Pyeloureteritis and urinary stasis of greater or lesser degree are the usual accompaniments of pregnancy.

In the discussion of pyeloureteritis complicating pregnancy, too much emphasis has quite naturally been placed upon the acute or febrile phase of the disease. It is so much more obvious than the chronic and can frequently be diagnosed without the aid of laboratory or other special procedures, with the result that the chronic or afebrile phase has been neglected.[28]

SUMMARY AND CONCLUSIONS

1. Some knowledge of female urologic conditions is indispensable in making gynecologic and obstetric diagnosis. Embryologically the genitourinary and the genital system are intimately related.
2. Infections of the genital and genitourinary tracts frequently originate from the gastrointestinal tract. Gram's method for stains is beneficial in diagnosing infection of the urinary system.
3. Pyelitis, ureteral stricture and other infections of the urinary tract frequently cause bizarre abdominal pains or gas in the stomach and intestines.
4. Urine cultures may be sterile but often contain the bacterial offenders ordinarily associated with urinary infection, especially Escherichia coli, Bacillus proteus and beta hemolytic Staphylococcus aureus.
5. Many infections of the urinary tract can be controlled by sulfonamide preparations or antibiotics, such as aureomycin or terramycin. Penicillin or streptomycin is not necessary in every case.

6. Innervation of the genitourinary system is derived from ganglia along the aortic and celiac plexuses.

7. Proper evaluation of the extent and seriousness of the disease should be made before therapeutic abortion is advised.

8. Stasis in the urinary tract during pregnancy favors the development of pyelonephritis.

9. Renal tuberculosis, carcinoma of the urinary tract or polycystic renal disease usually contraindicates pregnancy.

10. The pyelonephritis of pregnancy is frequently preventable.

11. Great strides have been made in the past fifteen years in the use of chemotherapy and antibiotics for infections of the urinary tract.

12. A preliminary test of sensitivity is valuable.

13. Physiologic dilatation of the ureters during pregnancy may result in pathologic change. Dilatation is usually more marked on the right than on the left.

14. Obstetricians, gynecologists and urologists should work together as a team. If this is not practicable, obstetricians and gynecologists should know something of female urologic diseases.

RÉSUMÉ

1. Un certain degré d'expérience dans les conditions urologiques est indispensable dans la pratique gynécologique et obstétrique. Pendant la vie embryonale le système génito-urinaire est intimément relié au système génital.

2. La pyélite, les infections des urétères et d'autres parts du système urinaire causent souvent des douleurs bizarres abdominales et du gas dans l'estomac et les intestins.

3. Des infections des voies génitales et urinaires ont leur source souvent dans le trait gastro-intestinal. La méthode de Gram est souvent utile dans la diagnose différentielle d'une infection dans les voies urinaires.

4. Les cultures de l'urine peuvent être stériles. Mais souvent ils contiennent des microbes, qui produisent des infections urinaires ordinaires, surtout les bacilles coli.

5. Beaucoup d'infections urinaires peuvent être guéris par des préparations sulfonamides ou des antibiotiques comme l'auromycine ou terramycine, sans avoir besoin d'employer du penicilline ou streptomycine.

6. L'innervation du système génito-urinaire est dérivée des ganglions tout le long du plexus aorticus et céliacus.

7. Une évaluation exacte de l'étendu et de la sévérite de la maladie doit être faite avant que le conseil d'un avortement therapeutique soit donné.

8. La congestion dans les voies urinaires pendant la gestation favorise le dévéloppement de pyélo-nephrite.

9. La tuberculose rénale, le cancer rénal et la maladie polycystique des reins sont en général des contraindications de grossesse.

10. Il est souvent possible, d'éviter la pyélonephrite de gestation.

11. Pendant les dernieres quinze années un progres enorme s'est produit en chémotherapie antibiotiques et dans l'usage de la dermothérapeutique contre les infections des voies urinaires.

12. Un examen préliminaire de sensibilité est important.

13. La dilatation physiologique des urétères pendant la gestation peut être suivie des changements pathologiques. En général la dilatation est plus remarquable sur le coté droit que sur le coté gauche.

14. Les accoucheurs, gynécologues et urologes devaient travailler ensemble comme une équipe. En cas que cela n'est pas possible, l'obstétricien et le gynécologue devaient avoir une certaine connaissance des maladies urologiques chez la femme.

RIASSUNTO

1. Alcune nozioni di urologia sono indispensabili nella pratica ostetrica e ginecologica. Vi sono stretti rapporti embriologici fra il sistema urinario e quello genitale.

2. Le infezioni urinarie, comme quelle genitali, spesso sono di origine intestinale. Il metodo di Gram è molto utile per la diagnosi batteriologica delle infezioni urinarie.

3. La pielite e altre infezioni urinarie spesso sono causa di dolori addominali vaghi, o di meteorismo.

4. L'urino-cultura può essere sterile, ma spesso contiene i germi delle infezioni urinarie e specialmente l'Escherichia Coli, il proteus e lo stafilococco aureo beta emolitico.

5. Molte delle infezioni urinarie possono essere curate con successo mediante i sulfamidici e gli antibiotici (aureomicina, terramicina). Penicillina e streptomicina non sempre sono necessarie.

6. L'innervazione del sistema genitourinario deriva dai gangli dei plessi aortico e celiaco.

7. Ogni malattia deve essere vagliata accuratamente nella sua importanza e gravità prima di decidere sull'aborto terapeutico.

8. La stasi urinaria in gravidanza favorisce la pielonefrite.

9. Tubercolosi renale, carcinoma delle vie urinarie e malattia policistica del rene di solito controindicano la gravidanza.

10. La pielonefrite in gravidanza di regola può essere prevenuta.

11. Grandi progressi sono stati fatti negli ultimi 15 anni nella cura delle infezioni urinarie mediante chemioterapici e antibiotici.

12. E'sempre utile eseguire le prove di sensibilità.

13. La dilatazione fisiologica dell'uretere durante la gravidanza può divenire pericolosa; di solito è maggiore a destra.

14. Ostetrici, ginecologi e urologi dovrebbero agire di comune accordo, e quando ciò non sia possibile gli ostetrici e i ginecologi dovrebbero formarsi una preparazione in campo urologico.

ZUSAMMENFASSUNG

1. In der gynäkologischen und geburtshilflichen Diagnostik ist eine gewisse Kenntnis urologischer Erkrankungen unerlässlich. Der Harn-und der Geschlechtsapparat stehen embryologisch in engem Zusammenhang.

2. Infektionen des Harn-und Geschlechtsapparates stammen häufig aus dem Magendarmkanal. Die Gramsche Färbemethode ist bei der Diagnose von Infektionen des Harnsystems von Wert.

3. Nierenbeckenentzündungen, Harnleiterentzündungen und andere Infektionen des Harnapparates erzeugen häufig merkwürdige Bauchschmerzen oder Gasansammlungen im Magen und im Darm.

4. Aus dem Urin gewonnene Kulturen können zwar steril sein, enthalten aber auch häufig die bakteriellen Erreger, die im allgemeinen mit Infektionen des Harnapparates in Verbindung gebracht werden, besonders E. coli, Bac. proteus and B. staphylococcus haemolyticus aureus.

5. Viele Infektionen des Harnapparates lassen sich mit Sulfonamiden oder mit Antibiotika wie Aureomyzin oder Terramyzin heilen. Penizillin oder Streptomyzin sind nicht in jedem Falle notwendig.

6. Die Nervenversorgung des Harn- und Geschlechtsapparates stammt aus neben der Aorta liegenden Ganglien und aus den zöliakalen Geflechten.

7. Ehe eine therapeutische Unterbrechung der Schwangerschaft angeraten wird, muss die Ausbreitung und die Schwere der Erkrankung sorgfältig abgeschätzt werden.

8. Verlangsamung des Harnabflusses während der Schwangerschaft begünstigt

die Entwicklung einer Pyelonephritis.

9. Das Bestehen einer Nierentuberkulose, eines Krebses des Harnsystems oder einer polyzystischen Nierenerkrankung bildet im allgemeinen eine Kontraindikation zur Schwangerschaft.

10. Das Auftreten einer Schwangerschaftspyelonephritis lässt sich häufig verhüten.

11. In den letzten 15 Jahren sind auf dem Gebiete der Chemotherapie, mit Antibiotika usw. sowie in der dermatologischen Therapie grosse Fortschritte gemacht worden, die der Behandlung von Infektionen des Harnapparates zugute kommen.

12. Es empfiehlt sich, vor der Behandlung Sensitivitätsprüfungen auszuführen.

13. Die physiologische Erweiterung der Harnleiter während der Schwangerschaft kann zu krankhaften Veränderungen führen. Gewöhnlich ist die Erweiterung auf der rechten Seite stärker als auf der linken.

14. Zusammenarbeit von Geburtshelfern, Gynäkologen und Urologen ist erstrebenswert. Wo das nich möglich ist, müssen die Geburtshelfer und Gynäkologen Kenntnisse von den Erkrankungen des weiblichen Harnapparates besitzen.

RESUMEN

1. Para hacer el diagnóstico en ginecología y obstetricia se requiere cierto conocimiento de los padecimientos urológicos. Los sistemas genital y urinario se encuentran íntimamente relacionados desde el punto de vista embriológico.

2. Las infecciones del aparato genital y del genitourinario frecuentemente se originan en el aparato digestivo. La tinción por el método de Gram resulta útil para diagnósticar las infecciones urinarias.

3. La pielitis y otras infecciones urinarias frecuentemente producen dolores abdominales atípicos y meteorismo gástrico e intestinal.

4. Los cultivos de orina pueden resultar estériles pero frecuentemente contienen bacterias que generalmente producen infecciones urinarias tales como la Escherichia coli, Bacilus proteus y Stafilococo beta hemolítico.

5. Muchas infecciones urinarias pueden ser controladas con preparados sulfamídicos o antibióticos tales como aureomicina y terramicina. La penicilina y la estreptomicina no son necesarias en todos los casos.

6. La inervación del aparato genitourinario se deriva de los ganglios que se encuentran adyacentes a la aorta y de los del plexo celíaco.

7. Antes de que se recomiende un aborto terapéutico se debe hacer una valorización adecuada de la extensión y la gravedad del padecimiento.

8. El estasis de la vía urinaria que se presenta con el embarazo favorece el desarrollo de pielonefritis.

9. En la misma forma, la tuberculosis renal, el carcinoma de la vía urinaria y el riñón poliquístico constituyen una contraindicación para embarazo.

10. Frecuentemente se puede prevenir la pielonefritis del ambarazo.

11. En los últimos cinco años se han hecho muchos progresos por la quimioterapia, los antibióticos, etc. en el tratamiento, acerca del uso de la dermatoterapia y antibióticos, para las infecciones de la vía urinaria.

12. Es de valor el empleo de una prueba de sensibilidad.

13. La dilatación fisiológica de los ureteros en el embarazo puede producir cambios patológicos. Dicha dilatación generalmente es más marcada en el lado derecho que en el izquierdo.

14. Los tocólogos, ginecólogos y urólogos deben de trabajar formando un equipo. Si esto no se puede llevar a cabo entonces los tocólogos y los ginecólogos deberán de tener conocimientos de padecimientos urológicos femeninos.

REFERENCES

1. Zilliacus, H., and Totterman, L. E.: Raised Incidence of Infection in Infants Born to Mothers with Infection of the Urinary Tract at the Time of Delivery, Gynaecologia 135 (June) 1953.
2. Stept, R.: Importance of Vaginitis in Urinary Infections of Childhood, J. Urol. 72 (Nov.) 1954.
3. Reich, W. J., and others: Urological Disorders Related to and Clinically Simulating Gynecological Pathology, Urol. & Cutan. Rev. 55:587 (Oct.) 1951.
4. Ball, T. L., and Fulkerson, L. L.: Female Urinary Incontinence, Urol. & Cutan. Rev. 55: 591 (Oct.) 1951.
5. Russell, K. P., and Tollefson, D. G.: Urologic Indications for Therapeutic Abortion, Urol. & Cutan. Rev. 55:604 (Oct.) 1951.
6. Everett, H. S.: The Treatment of Urinary Infections with Sulfasuxidine, Am. J. Obst. & Gynec. 49:114-127, 1945.
7. Bernstine, J. B., and Warren, G. H.: Am. J. Obst. & Gynec. 61:1329, 1951.
8. Ball, T. L.: M. Clin. North America 35: 1951.
9. Butt, A. J., and others: Am. J. Obst. & Gynec. 60:908 (Oct.) 1950.
10. Kretschmer, H. L.: Illinois M. J. 99:128 (March) 1951.
11. Chute, R.: Nontuberculous, Nongonorrheal Infections of the Urinary Tract, Nelson's Monographs on Surgery 307-356, 1950.
12. TeLinde, R. W.: Am. J. Obst. & Gynec. 60: 273-284 (Aug.) 1950.
13. Braasch, W. F., and Mussey, R. D.: Complications in the Urinary Tract During Pregnancy, Minnesota Med. 28:543-547 (April) 1945.
14. Collins, H. S., and Findlan, M.: Aureomycin Treatment of Urinary Tract Infections, Surg., Gynec. & Obst. 89:43-48 (July) 1949.
15. Cook, E. N.: Symptoms, Diagnosis and Treatment of Infections of the Urinary Tract, M. Clin. North America 33:1071-1078 (July) 1949.
16. Everett, H. S., and Long, J. H.: The Treatment of Urinary Infections, Am. J. Obst. & Gynec. 67:916-930 (April) 1954.
17. Fetter, T. R.: The Management of Urinary Infections, M. Clin. North America 33:1465-1480 (Sept.) 1949.
18. Halkier, E., and others: The Importance of Antibiotics in the Treatment of Urinary Infections, Acta chir. Scand. 104:468-477, 1953.
19. Herrold, R. D.: The Present Status of Antibiotics and Other Agents for the Treatment of Urinary Infections, S. Clin. North America 30: 61-69 (Feb.) 1950.
20. Hoffman, E. S.: The Urinary Tract in Pregnancy and the Puerperium, Grace Hosp. Bull. 28: 71-84 (July) 1950.
21. Hundley, J. M. Jr., and others: Some Physiological and Pathological Observations on the Urinary Tract During Pregnancy, Surg., Gynec. & Obst. 66:360-379 (Feb.) 1938.
22. Johnson, C. G., and others: Treatment of Urinary Tract Infections with Sulfathalidine (phthalylsulfathiazole), Am. J. Obst. & Gynec. 56:160-166 (July) 1948.
23. Marshall, V.: A Reconsideration of the Treatment of Urinary Infections, M. Clin. North America 34:525-533 (March) 1950.
24. McCaffery, R., and Hess, E.: Urological Complications of Pregnancy and Labor, Nebraska State M. J. 31:392 (Oct.) 1946.
25. Mulholland, S. W., and others: The Management of Urinary Tract Infections, J.A.M.W.A. 8:393-397 (Dec.) 1953.
26. O'Conor, V. J.: Urinary Antiseptics: Past and Present: Fact and Fancy, Proc. Inst. Med., Chicago, 19:187-199 (Dec. 15) 1952.
27. Prather, G. C.: Urological Complications of Pregnancy, J. Indiana State M. A. 30:371-379 (Aug.) 1937.
28. Taylor, H. C.: Urological Complications of Pregnancy, Meriden Hosp. Bull., Meriden, N. D.
29. Traut, H. F., and Kuder, A.: Inflammation of the Upper Urinary Tract Complicating the Reproductive Period of Woman, Internat. Abst. Surg. 67:568-584 (Dec.) 1938.

◆

Human nature loses its most precious quality when it is robbed of its sense of things beyond, unexplored and yet insistent.

—*Whitehead*

Prevention of Fetal Wastage: The Obstetrician's Point of View

JOHN W. H. GLASSER, M.D.

RADBURN, NEW JERSEY

THOUGH the safety and welfare of the mother are the primary concern of the obstetrician, it is well to recall that the fetus runs a close second. The obstetrician's obligation is unfulfilled unless a healthy mother goes home with an equally healthy child. Short of this he fails, no matter what the circumstances. Purely statistical considerations, therefore, should never cause him to withhold his surgical hand and persist in "masterly inactivity" while a fetus whose survival is jeopardized mutely depends on him for his only chance. In the many life-threatening complications that may arise, as has been emphasized by Aldridge, what is good for the mother is almost invariably good for the child. Accordingly, most correct decisions will benefit both lives concerned. Rarely indeed is it indicated to sacrifice the fetus for the safety of the mother, except possibly in such situations as persistent or worsening toxemia or uncontrollable hemorrhage from placenta praevia, prior to viability.

Review of the chief causes of fetal loss in the light of current accepted practice suggests that there is still much room for improvement. Particularly in this great medical center, the recent studies of Potter, Adair, Bundesen and others have focused our attention on this problem, with a widespread salubrious effect on the perinatal loss. In order of frequency, the causes of fetal loss are usually as follows: anoxia, severe malformations, intrauterine death of unknown cause, prematurity, erythroblastosis, birth trauma, infection and syphilis. Recurrence of these familiar threats to the fetus should recall previous experiences, personal or otherwise, in which the child was lost, and one's obstetric conscience should become sensitized and one's hands energized to interfere in Nature's process, if need be, to achieve a happier result. To learn from past experiences, sometimes sad, and apply these hard-learned lessons to the problem at hand is the obstetrician's duty.

In all complications of the causes of fetal loss, anoxia heads the list. Chief among causes of intrauterine anoxia are placenta praevia and abruptio placentae. Significant blood loss, whether maternal, fetal or both, means lowering of the oxygen supply to the fetus, who is already adapted to a perilously low level of oxygen saturation. Hence it is mandatory to control hemorrhage and replace lost blood promptly in both conditions. Uncontrollable hemorrhage in either case will force one to terminate the pregnancy in the maternal interest, no matter what the fetal chances are. More often, fortunately, the initial hemorrhage ceases, providing a "breather" and an opportunity for re-evaluation of the case. In cases of placenta praevia, prior to the thirty-third or thirty-fourth week, digital examination of the cervix is best avoided, for fear of starting an uncontrollable hemorrhage that may force one's surgical hand. It is far better to make this diagnosis by ex

---

Read at the Nineteenth Annual Congress of the United States and Canadian Sections, International College of Surgeons, Chicago, Sept. 12-15, 1954.
Submitted for publication March 29, 1955.

having ruled out polyp, bleeding erosion and carcinoma by speculum examination. Bed rest, sedation, replacement of blood by prompt and sufficient transfusions, plus patience, will enable many such problems to be carried beyond the thirty-fourth week, when the fetal chances are much better. In the absence of rectal examination and intracervical palpation to obtain scientific certainty of the diagnosis, rare indeed will be the necessity of terminating the pregnancy prior to this time, although the threat of alarming secondary hemorrhage is admittedly always present. For ost primigravidae cesarean section is the ethod of choice for delivery, as well as all cases of central placenta praevia. This is employed in about 75 per cent of all cases at the Margaret Hague Maternity Hospital. For the multigravidae with lateral placement of the placenta, simple rupture of the membranes will suffice in the presence of a favorable cervix, but in all cases the degree of hemorrhage, the parity and the condition of the cervix, and not the exact anatomic location of the placenta, determine the method of delivery. Bagging and version are now thoroughly passé in the treatment of this condition, and the Willett forceps is best used on a dead fetus, with a lateral placenta praevia.

In cases of abruption the pregnancy is best terminated when the diagnosis is made, while the patient is in good condition, regardless of the period of gestation, because the retroplacental hemorrhage may spread at any time after the initial episode, killing the baby and possibly causing severe damage to the uterine musculature, lower nephron necrosis in the maternal kidneys and, rarely, alarming afibrinogenemia. In the presence of an unfavorable cervix, cesarean section is by far the best solution. On the other hand, because of the irritating effect of the retroplacental clot, labor commonly ensues rapidly and progresses apace after abruption. Simple stripping and rupture of the membranes will speed up this process, particularly in multiparae. Intravenous pitocin infusions, possibly aided by the relaxing effect of conduction anesthesia, will help. Certainly in the presence of a dead fetus one should not rush in to do a cesarean section, unless the degree of continuing blood loss and shock make it essential to terminate this unfortunate pregnancy at once.

Although cesarean section was formerly used in about 30 per cent of cases of abruptio placentae at the Margaret Hague Maternity Hospital, in a recent ten-year series it was employed in only 14 per cent. In the conduct of those cases in which vaginal delivery is contemplated, shortening the second stage by judicious use of the forceps will save the babies in many cases of moderate and occasional cases of severe abruption. It is well to recall, however, that one is dealing with a highly lethal threat in which prompt abdominal delivery may save a few more severely jeopardized babies whenever immediate or soon forthcoming vaginal delivery is out of the question. The bad abruptions, in which the maternal shock and blood loss, whether external or concealed, are such that prompt abdominal delivery is the only safe thing to do for the mother, will always be a plague to the obstetrician. This is one of the few indications for cesarean section in the presence of a dead fetus.

Under anoxia are included fetal losses due to accidents involving the cord—prolapse, tight loops about the body, knots, a pathologically short cord, excessive torsion or rupture of the rare vasa praevia. Here the problem is one of prompt recognition and early oxygen therapy to the mother, while a plan of delivery is worked out. It is mandatory that the fetal heart be checked at least every fifteen minutes during labor, particularly after rupture of the membranes. During the second stage knots and loops may be drawn tight, causing sudden fetal distress often manifested by violent activity. Constant attention at this time is essential to good results with the fetus; prompt but unhurried delivery should be accomplished whenever distress is evidenced. Caution must be exercised, however, to avoid undue and damaging speed in delivery, for it is easy, when impelled by the urgency of a fetal cacorhythmia or the obvious presence of a pulseless prolapsed cord to substitute birth trauma for anoxia as the cause of death.

Should severe fetal distress become evident when the cervix is not fully or nearly fully dilated, a flat abdominal roentgenogram is indicated to rule out gross fetal abnormality. Given a presumably normal baby in these circumstances, one would do well to forget manual dilatation of the cervix, followed by such procedures as version and extraction, and do an immediate cesarean section. This is the only method offering hope for the child. Accouchment forcé, followed by high forceps or midforceps application or version and extraction, sacrificed many mothers for the sake of badly and even fatally injured babies in the medieval era of obstetrics. Even with a fully dilated cervix, version and extraction under these circumstances has run up a sufficiently impressive score of ruptured uteri and injured children that it also would best be forgotten, except possibly in the case of a small fetus, a large pelvis, some amniotic fluid left in the gently relaxing uterus, a fully or nearly fully dilated cervix and an experienced versionist. But these conditions are rarely encountered.

Whenever these ideal conditions are not present, it is far better to place the patient in the deep Trendelenburg position to relieve the pressure of the presenting part against the pelvic brim, releasing the cord caught in between, while oxygen is administered by mask to the mother and preparations are made for an immediate cesarean section. At such times a trusty resident's hand in the vagina will dislodge the presenting part and hold it up long enough to permit safe delivery of the child. When the cervix is fully dilated, a judicious forceps or breech extraction from the midpelvis will solve the problem, but here again the hands trained in the use of Kielland and axis traction forceps and all the niceties of a safe breech extraction will yield the best results.

Another cause of anoxia is the cerebral compression resulting from prolonged labor. This carries a high fetal loss if incorrectly handled. When labor is protracted beyond twenty-four hours, or even earlier if progress ceases, the case should be reevaluated by a competent consultant. All obstetricians have learned the hard way that the mere fact that a patient is a multipara is no insurance at all that she will not have trouble in her current labor! Vaginal examination under sterile conditions is indicated to determine the cause of the delay, whether it be a malpresentation (brow or face), malrotation (such as occiput posterior or transverse, usually deflexed when causing delay), a pathologically firm cervix (recently emphasized by Calkins), a constriction ring, or a pelvis inadequate in size and architecture for the birth of this particular child. Relative disproportion is usually obvious; with firm pressure above, the presenting part, albeit molded as well as possible to fit the narrowed passage, simply does not engage. Under conditions deemed probably favorable for vaginal delivery the membranes may then be stripped and ruptured to improve the quality of labor and, in truly borderline cases, to insure that an adequate test of labor is being made. Plenty of intravenous fluid, adequate sedation and antibiotics are indicated, with due respect for those stalwarts who do not believe in prophylactic antibiotics. As Dr.

Waters suggested, the obstetrician is then *given a sedative and is put to bed, while* Nature is given a decent test of labor, to see what can be accomplished!

Of course, in cases of malpresentation and disproportion, cesarean section should be performed promptly. Prolongation of the impossible obstructed labor merely exhausts the mother, kills the fetus by a combination of anoxia and infection and wears out everybody concerned, for exactly nothing. Such meddlesome midwifery is radical in its disregard of the right of the fetus to a decent chance of survival. Nowadays in cases with favorable or borderline conditions, a first stage of twenty-four to thirty hours without adequate progress is considered by many an indication for section. Here the high social value of the child of an elderly primigravida, the first successful conception in a habitual aborter, a woman with history of prolonged sterility, or a primiparous breech in a borderline pelvis may weigh the decision toward cesarean section, and this is conservatism of the first order, from both the maternal and the fetal point of view. Poor, desultory labor, characterized by inertia, may be improved greatly, of course, by judicious use of infused pitocin in the absence of malpresentation, disproportion or uterine scar, and it is true that fewer sections are now being done for this indication. Such management will improve the formerly poor fetal results in cases of prolonged labor.

A few remarks concerning the fetal outcome in abdominal delivery are in order, for recent studies have emphasized the fact that this maternal panacea is not always the best solution for the fetus. Too many babies are still dying after cesarean section. Often, of course, the maternal indication for the section is simply lethal to the child, and when such cases are canceled out the fetal loss approaches, but never equals, the overall rate. Nevertheless, too many babies delivered by elective *section do poorly*, especially the premature. Prevention of premature delivery by elective section is largely accomplished by allowing the pregnancy to go to full term, dated at the onset of labor rather than two weeks prior to this date. Here a simple miscalculation by one month causes the pregnancy to be interrupted at thirty-four weeks rather than thirty-eight, and the surgeon's mask may scarcely conceal the chagrin he feels when he gazes upon the puny infant he has produced! This same error would be even more disastrous in the case of unsuspected twins. Preoperative estimation of the size of the fetus by palpation is difficult, and the distortion of roentgen images may make the fetus look larger than it is. Ossification centers have more scientific significance to the trained eye, and the radiologist may predict more closely the exact week of gestation. In general, however, one must simply learn to avoid elective section unless the child is large enough.

Careful suction of blood and fluid from the child's face during delivery should be the assistant's responsibility. The cord should be milked gently to give the baby an adequate increment of placental blood prior to clamping, and the child should then be placed in a warm crib in the operating room, under the immediate care of a resident obstetrician or pediatrist experienced in fetal resuscitation. Careful evacuation of the normally large amount of fluid in the stomachs of "section babies" *may eliminate much of the respiratory difficulty* observed among them. This is true particularly in the case of premature babies, in whom the hyaline membrane syndrome is more common. Occasional term babies delivered by section will also show evidence of hyaline membrane and meningeal edema as well, which are not present in those delivered *per vaginam*.

As in vaginal deliveries, the type of

analgesia, preoperative medication and anesthesia employed for cesarean section influence greatly the condition of the fetus. Heavy doses of barbiturates and narcotics through a trial labor, followed by slowly induced and prolonged general anesthesia, often depresses the child to such a point that persistent resuscitative measures, tracheal suction and even flagging may be necessary. Here is the great advantage enjoyed by babies delivered under conduction anesthesia, which also yields dividends in the maternal interest. In emergency section under such anesthesia, oxygen administered continuously to the mother during the operation will improve the fetal heart tones and give the baby a much better chance for survival.

During the days of my residency it was not uncommon to be called to the delivery room two or three times daily for resuscitation of severely depressed babies. Pharyngeal, tracheal and gastric suction, use of the Kreiselman apparatus and flagging, when necessary, were routine. In recent years the trend has been away from heavy doses of barbiturates and repeated doses of demerol or morphine and scopolamine, particularly when general anesthesia was to be employed later. The use of smaller doses of analgesic medicaments, supplemented by trilene and followed by local infiltration, saddle block or caudal, has obviated most of this problem, yielding babies who cry vigorously at birth unless compromised by some other cause of anoxia. These healthy trends will lead to ever better fetal survival rates and will tend to eliminate most of the problem of asphyxia neonatorum.

The toxemia of pregnancy accounts for much fetal loss *in utero*, in which autopsy usually fails to reveal any cause of death. At or near term there is no problem other than to choose the method of delivery. Termination by induction in favorable cases and section in unfavorable ones cures the toxemia, saves the babies and prevents remote renal damage from prolongation of the toxic process. At twenty-six to thirty-two weeks, on the other hand, the development of true toxemia is a thorny problem, of which, sadly enough, even the modern miracle-working derivatives of veratrum viride, apresoline and the alkaloids of Rauwolfia are no certain solution. Here one must gamble, for the fetus, the risk of prematurity outside the uterus against the risk of remaining in the highly toxic environment within. By all means one should attempt to carry the pregnancy through the thirty-third or thirty-fourth week, for the survival rate of premature babies rises percipitously after this period of development. Many babies, however, die *in utero* after two or three weeks of persistent toxemia, and further prolongation is bad for both mother and child. Fetal loss, renal damage and the development of hypertension later are the prices paid for procrastination in the presence of established toxemia. At such an early stage induction of labor and vaginal delivery are not often feasible, and nowadays recourse is more often had to section.

Especially lethal to the fetus and damaging to the mother is preeclampsia superimposed on preexisting hypertension, even of mild degree. In such cases, in spite of the most exacting regimes and close observation, high fetal losses will continue to plague the obstetrician. I have lost 2 such babies already this year. In cases of severe fulminating preeclampsia, no matter what the period of gestation, as soon as the signs and symptoms subside or become stabilized in response to sedative, diuretic and antitensive therapy the uterus should be emptied by appropriate means rather than left in *status quo* until the toxemia worsens again, with high fetal loss. Certainly after the thirty-third or thirty-fourth week the child's chances are infinitely better outside. Finally, as has been emphasized by Falls, in the face of rapidly progressive toxemia that shows no response within twenty-four hours of intensive therapy, one's only recourse is to terminate the pregnancy on an emergency basis, chiefly to prevent full-blown eclampsia.

Such radicalism in the management of toxemia will save many more babies and spare many maternal kidneys severe damage. It will also avert such disasters as eclampsia and concealed hemorrhage due to abruption, complications that occur often enough to be feared by any obstetrician of experience. The usually negative autopsy observations on these babies, except for the degree of prematurity, suggests that the lethal factor is a chemical, presumably of placental origin.

Thus far this presentation has been concerned with such major problems as placenta praevia, abruptio placentae, cord complications and prolonged labor, under the headings of anoxia and toxemia, with some comments on the handling of babies delivered by cesarean section and the present-day trends in obstetric analgesia and anesthesia. Such major problems as prematurity and birth trauma will now be considered, followed by practical considerations as to the prevention of fetal wastage in cases of maternal diabetes, erythroblastosis, syphilis and abortion, with some additional comment on the present-day attitude toward treatment of the "habitual aborter." Some recommendations with regard to the future study of fetal loss are also presented.

Prematurity accounts for 50 per cent of fetal loss in the first ten days of life. The cause of premature termination of gestation is often apparent — placenta praevia, abruptio placentae, toxemia, premature rupture of the membranes, multiple pregnancy, etc.—but frequently the underlying reason is obscure. Despite brilliant advances in pediatric care, which nowadays permit the salvage of vastly more premature babies than was possible a few years ago, the fetal loss in this group remains high, owing chiefly to pulmonary immaturity. Every effort, accordingly, must be made to prevent premature labor by such measures as careful dietary instruction of all prospective mothers, especially in the low income group; conservative management of placenta praevia prior to the thirty-fourth week; careful supervision of hypertensive and preeclamptic patients; multiple pregnancies; hydramnios, and known "repeaters" of premature loss. In such cases there seems to be real value in prolonged bed rest, sedation and progesterone (and possibly stilbestrol) in quieting the tendency of the uterus to go into premature labor. In a recent case at the Margaret Hague Maternity Hospital a primigravida whose membranes ruptured at twenty-six weeks was carried by such means to thirty-seven weeks and was finally delivered of a healthy child weighing 5½ pounds (2,595 Gm.), after soaking nearly 900 vaginal pads with amniotic fluid. Eleven weeks in bed is quite a price to pay, but in this instance it paid off handsomely. More often, of course, the outcome is not so favorable, but the method is worth trying. For women who repeatedly miscarry at twenty-four to thirty weeks for no apparent reason, a very high protein and high vitamin diet, progesterone and stilbestrol in high dosage (although of debated value) and bed rest through the critical period of prior losses are well worth while.

Once it is evident that a premature delivery is forthcoming, consultations with both obstetrician and pediatrist are desirable to secure the best result. Whereas it was formerly necessary for the parturient to forego the usual sedation in the interest of her premature baby, the high degree of development of conduction anesthesia has made it possible to circumvent this difficulty. By such means the fetus receives a high concentration of oxygen without the deleterious depressant effects of narcotics and barbiturates, with tremendous improvement in the all-important respiratory function. Gentle, slow delivery of the fetal head, aided if necessary by carefully controlled forceps with deep episiotomy to prevent undue pressure, while the mother receives adequate oxygen by mask, will yield rich dividends in fetal salvage. The alerted pediatric staff, present in the delivery room with adequate training and equipment for suction and resuscitation, will be only too glad to receive the premature child first hand and set it safely on its way to survival through the first few critical days of life.

Although the rate of fetal loss from birth trauma is gratifyingly less than in former years, in three types of deliveries it remains far too high, and the obstetric conscience should be sensitized to this tragic loss of otherwise normal babies. The difficult midforceps procedure should be done only by a competent obstetric consultant. Gone forever should be the days of attempting forceps delivery without definite knowledge that a pelvic abnormality, a malpresentation or a malrotation is present. No longer should one hear of pelvic application of forceps to unrotated heads, or of putting one's foot against the delivery table and pulling with all one's weight on axis traction forceps. Yes, many babies have been and still *can* be delivered in this way, but they will not all survive, and some will be spastic later on, to haunt the obstetrician's memory. When a competent consultant appraises such a situation, aided by roentgenograms of the maternal pelvis with the appropriate forceps in cephalic application, the amount of force presumably necessary to effect delivery even by his trained hands, after proper correction of malrotation, deflection and asynclitism, may be considered excessive for safety. Not only is it a question of what might happen to the delicate vein of Galen, the falx and the tentorium, but of the safety of the maternal tissues as well. It is by far the better part of valor to remove the forceps without further trial and to prepare to deliver the baby by section, preferably extraperitoneal. Certainly it is no unforgivable crime to admit that a "trial forceps" has become a "failed forceps"! Rather is it unforgivable to persist in doing what one's common sense should have told one to stop doing long ago. And this applies ever more to face, brow and deflexed posterior occipital presentations. Extraperitoneal cesarean section even at the eleventh hour is a far better solution, for, as one of my revered teachers often said, "After all, what is a cesarean section but a high forceps delivery through a suprapubic incision?"

In breech delivery the problem is even more closely pinpointed to lack of training, skill and judgment of the attendant present, for in any large series of stillborn term breech presentations birth trauma accounts for the loss of nearly three-fourths of all the babies. Intracranial hemorrhage, ruptured liver, adrenal hematoma and a host of assorted fractures, dislocations, nerve palsies, etc., make up an impressive list of traumatic insults to the breech. In general, since space does not permit adequate detail, let me emphasize cessation of all attempts at breech delivery through contracted pelvises of any type. At least 15 per cent of all primary breeches should be delivered by section and possibly more. And may I plead for elimination of the procedure of decomposition and extraction of a frank breech from the midpelvis, except in highly trained hands? And since even in such hands the mortality of term breeches is more than 2 per cent in most series reported, [illegible] is about four [illegible] cians would do well to reconsider the virtues of external version at about the thirty-second week. And with persistent breech presentations one would get far better results by awaiting presentation of the buttocks at the vulva and then doing an assisted breech delivery, consisting of a deep episiotomy, preferably with the region under local infiltration anesthesia, aided by the expulsive efforts of the mother up to the level of the umbilicus. At this point, quick induction of general anesthesia with some such agent as vinethine will permit completion of the delivery; Piper's forceps may be used whenever the head does not come down readily with the Wiegand-Martin or the Mauriceau-Smellie-Veit maneuver. Or, whenever the breech does not descend well to the vulva, one can perform a cesarean section. This may appear radical, but it is the only way in which the bad fetal results of breech delivery will ever be improved.

What is true of breech presentation is even more apposite to version and extraction, which I have already touched on in connection with prolapsed cord. In trained hands, under ideal conditions, such a delivery may be spectacular and a joy to behold, but this is rarely the case, and this procedure would better be omitted from textbooks, except as employed occasionally for the second twin, when indicated. Only by such means will the fetal loss from birth trauma be further reduced.

Maternal diabetes remains a controversial problem in obstetrics. The high fetal loss, which ranges up to 30 per cent, challenges the obstetrician to give patients with this disease the best possible diabetic control during pregnancy, for this appears to be the most important factor in improving fetal salvage. The use of parenteral stilbestrol and progesterone in large enough quantities to alter the hormonal imbalance so often present, as advocated by Priscilla White, is the crux of the controversy. It is only fair to state, however, that her carefully controlled patients have yielded the highest fetal salvage in any significant series (16 per cent in 685 cases). She stresses the classification of diabetes into six types of increasing severity, rigid medical control and prompt, vigorous treatment are instituted should edema, hydramnios or toxemia appear. The pregnanediol level is followed carefully, and a significant drop therein is also interpreted as an indication for emergency delivery.

In patients with severe diabetes the critical period for intrauterine death is the thirty-sixth week; hence it is well accepted that pregnancy in such a patient be terminated by the end of the thirty-fifth week, or sooner, should uncontrollable preeclampsia or hydramnios appear, or should the pregnanediol level fall. Vaginal delivery is favored for the three less severe types, when obstetric conditions are favorable and induction is feasible, up to the thirty-seventh week. Cesarean section is favored for women with more severe diabetes, whose pregnancies are interrupted at the end of the thirty-fifth week. Careful preoperative and postoperative management are essential, and spinal anesthesia is advised in all cases. The newborn children of such mothers must be under the care of an alert pediatric staff, who will take prompt action to remove excess pharyngeal and gastric secretions, relieve respiratory embarrassment, mobilize edema, correct excessively low blood sugar levels and particularly try to prevent the highly lethal hyaline membrane syndrome, which was observed in 85 per cent of the babies coming to autopsy. White, in 535 hormone cases in which hormone therapy was used, had only 11 per cent of fetal loss, easily the best figure on record.

Commenting on this question, Waters said that the fetal loss, due to bad timing, in cases of diabetes is just as high as that from deferred interference. Certainly a nonsurviving prematurity is as bad as a death *in utero*, with a narrow range of safety between, i.e., about the thirty-fifth week. At New York Hospital, where hormone therapy is not used, much less rigid diabetic control was permitted and great stress was laid on the appearance of the eyegrounds as interpreted by a staff ophthalmologist, with prompt intervention when indicated by the increasing degree of vascular retinitis. Although routine cesarean section is certainly no panacea for the offspring of diabetic mothers, obstetric indications here carry greater weight in view of the huge size of many of these babies, their poor resistance to difficult labor and birth trauma and, on the other hand, their hazardous neonatal course, especially when premature. Vaginal delivery of milder involvement, favorable for induction and cesarean section for the more severe, plus adequate diabetic control, sufficient hormone therapy if any is used, and prompt intervention when indicated, will yield better results in this difficult group.

With erythroblastosis, as with diabetes, the closest cooperation between obstetrician and pediatrist will yield the best results. When antibody titre is increasing there is a great temptation to get the baby out of the toxic environment, once he is well beyond the danger of pulmonary immaturity. Outstanding authorities, such as Diamond, have demonstrated, however, that these babies do not tolerate prematurity well. Exchange transfusion may prove too shocking to the premature cardiovascular system. Accordingly, the concept of pre-term induction is now favored by some "middle roaders," and it does seem reasonable to remove the child from the noxious antibodies before he is seriously damaged. Certainly at thirty-six weeks or later most babies have a good chance for survival, and it seems to me that one should probably not hesitate to interrupt such a pregnancy with the aid of local infiltration or spinal anesthesia, with the pediatric staff ready for immediate typing and a Coombs Test of the cord blood, with exchange transfusion when indicated. This seems infinitely better than to wait until fetal motion ceases and a hydropic stillborn child is subsequently delivered—or a child severely anemic or even severely icteric within a few hours of birth, possibly beyond the point of complete recovery. I also favor the use of large amounts of vitamin C throughout all RH-negative pregnancies, in accordance with the work of Javert.

Maternal syphilis, formerly a frequent cause of fetal loss, need not be a problem nowadays, but one should not become overcomplacent about it. Prompt diagnosis and adequate treatment with penicillin prior to the third trimester is of course essential. It seems needless to repeat that all maternity patients are required by law to take serologic tests during each pregnancy and that failure to do this constitutes gross negligence.

One of the largest groups of fatally damaged babies has purposely not been discussed so far. This is the group with major abnormalities incompatible with life. Although one may say correctly that nothing can be done at this stage of knowledge to prevent such losses, obstetricians should endeavor to teach their patients to avoid all viral diseases in early pregnancy; to avoid all but absolutely essential exposure to toxins and radiation in the early weeks, and to maintain as high a level of general health and nutrition as possible.

And now a final word about fetal loss from abortions, both early and late: As is well known, the vast majority of such fetuses are abnormal, and the Almighty wisely excludes these from the already heavily burdened human family. About 10 per cent of all conceptions fall into this group. Whenever signs and symptoms of threatened abortion persist, in spite of therapy, for longer than one week, the pregnancy is usually a lost cause, and both psychic and economic interests are best served by a carefully performed curettage. Urine pregnancy tests at this time commonly will show a weakly positive or a negative result.

On the other hand, however, it is mandatory that we treat women threatened with abortion, both early and late, as well as threatened premature labor, with all the vailable agents of proved value. Controversy rages in research circles over stilbestrol, various vitamins, progesterone, thyroid extract, etc., but it seems only fair that practitioners should use whatever promising agents are at hand—with discretion of course. Bed rest, a high protein and high vitamin diet and certain restrictions concerning coitus and travel at the time of missed menses may help. I am personally partial to thyroid extract, vitamin C, stilbestrol and progesterone, but I admit that this is empiric therapy at best. Stilbestrol, which theoretically is absorbed best in the micronized form, may mask a missed abortion or may even make a missed abortion of one that was originally threatened, but I have delivered many normal babies from mothers whose bleeding stopped after heavy doses of this drug. One must continue to increase fetal salvage at every stage of gestation, in the face of all the life-threatening complications, awaiting the discovery of ever more potent agents that will strengthen one's hands.

Current suggestions by some that "habitual aborters" be treated prior to conception are worthy of trial. After several months of weight reduction, cyclic therapy of estrogen and progesterone, high vitamin and high protein diet, planned coverage and fertilization of "fresh ova" by an abundant daily supply of sperm throughout the fertile period from the eleventh day on, would seem to hold promise. Early diagnosis of pregnancy, with careful observation of urinary pregnanediol or vaginal smear studies to assay the endogenous progesterone supply, with prompt administration of adequate progesterone when indicated, has a more rational basis than the "shotgun" now employed by most obstetricians.

SUMMARY

The author summarizes the currently accepted practices at the Woman's Hospital and the Margaret Hague Maternity Hospital of Jersey City in dealing with the common causes of fetal loss. He states that the whole compass of obstetrics may be included in this almost endless discussion. Time does not permit but the mention of such rare fetus-saving measures as abdominal paracentesis in cases of acute hydramnios, the proper attitude toward postmaturity, or the avoidance of excessively rapid and traumatizing labor in multiparae induced by routine pitocin infusion, which bids fair to supplant normal labor in some localities. He expresses hope that the therapeutic suggestions here made of 1953-54, will focus the attention of obstetricians particularly on the problem of greater fetal salvage. As a guide, he suggests study of the detailed and comprehensive work sheet devised by Calkins and published in a recent issue of the *American Journal of Obstetrics and Gynecology*.

RESUMEN

El autor hace un resumen de lo que se ha aceptado comunmente en el Hospital para Mujeres y en el Hospital Maternidad Margaret Hague de Jersey City, en relación con las causas habituales de péridida fetal. El autor afirma que en esta discusíon infinita puede incluirse todo el campo de la

obstetricia. Debido a la escasez de espacio solamente se mencionan casos raros en los cuales una paracentesis abdominal salvó casos de hidramnios agudos, también se menciona la conducta a seguir hacia la postmadurez y para evitar el parto rapido y traumatizante en la multípara inducido por pitocin en venoclisis que se usa en algunas localidades con el objeto de substituir el curso normal del parto. El autor expresa su esperanza de que las sugestiones terapeúticas que se hacen aquí de 1953-54, llamen la atención de los parteros particularmente con relación al problema de la salvación del feto. Como guía, el autor sugiere un estudio del trabajo detalado y comprensivo desarrollad por Calkins y publicado en un número reciente de la revista *American Journal of Obstetrics and Ginecology.*

ZUSAMMENFASSUNG

Der Verfasser gibt einen Überblick über die im Woman's Hospital und im Margaret Hague Maternity Hospital in Jersey City akzeptierten Methoden zur Bekämpfung der alltäglichen Ursachen des Verlusts ungeborener Kinder. Er weist darauf hin, dass die fast grenzenlose Diskussion dieses Problems das gesammte Gebiet der Geburtshilfskunde einschliesst. Die Kürze der Zeit gestattet nicht mehr als die Erwähnung gewisser seltener fötusrettender Massnahmen wie die Punktion der Bauchhöhle in Fällen von akutem Hydramnion, die richtige Einstellung gegenüber dem Übertragen der Frucht und die Vermeidung eines übertrieben raschen und traumatisierenden, durch routinemässige Infusion von Pitressin bei Mehrgebärenden eingeleiteten Geburtsvorganges, der an manchen Orten den normalen Geburtsvorgang zu ersetzen verspricht. Der Verfasser hofft, dass seine in den Jahren 1953 und 54 aufgestellten therapeutischen Vorschläge die Aufmerksamkeit der Geburtshelfer besonders auf das Problem der Erhaltung des Fötus in grösserem Umfange lenken mögen. Als Leitfaden schlägt er das Studium des detaillierten und umfassenden Arbeitsplans vor, den Calkins aufgestellt hat, und der in einer der letzten Nummern des *American Journal of Obstetrics and Gynecology* veröffentlicht worden ist.

RÉSUMÉ

L'auteur résume les méthodes adoptées a "Womens Hospital" et "Margaret Hague Maternity Hospital" a Jersey City en evaluant les causes ordinaires de la mortalité foetale. Il croit que la domaine entière de l'obstetrie devait être inclue dans cette discussion indéfinie. Le temps ne permet que de faire mention des mesures rares, comme la paracentèse abdominale dans les cas d'hydramnios aigu, la propre attitude envers la postmaturité et la nécessité d'éviter du dommage fait aux femmes multipares par un accouchement excessivement rapide a l'aide d'infusions de pitocin, traitement qui parait prendre la place de la couche normal a quelques endroits. Il espère que les recommandations therapeutiques qu'il a donné en 1953/54 vont diriger l'attention des accoucheurs au problème d'une meilleure conservation de la vie foetale. Il recommande l'étude du guide detaillé et compréhensif de Calkins qui était publie récemment dans le Amer. Journal of Obstetrics and Gynecology.

RIASSUNTO

L'autore espone i metodi in uso al Woman's Hospital e al Margaret Hague Maternity di Jersey City per combattere le cause più comuni della mortalità fetale. L'argomento abbraccia tutta l'ostetricia e ne seguirebbe un discussione senza fine; per ragioni di tempo, tuttavia, egli si limita a ricordare la paracentesi dell'addome nell'idramnio acuto, il trattamento della post-maturità, l'abolizione di parti

troppo rapidi e traumatizzanti come sono quelli che si ottengono con l'uso della pituitrina.

Egli esprime, inoltre, la speranza che questi suggerimenti potranno richiamare l'attenzione degli ostetrici sul problema della neonati-mortalità e li invita a leggere un lavoro di Calkins pubblicato recentemente sull'American Journal of Obstetrics and Gynecology.

◆

It is very difficult to be wholly joyous or wholly sad on this earth. The comic, when it is human, soon takes upon itself a face of pain; and some of our griefs (some, not all, for it is the capacity for suffering which makes man august in the eyes of men) have their source in weaknesses which must be recognized with smiling compassion as the common inheritance of us all. Joy and sorrow in this world pass into each other, mingling their forms and their murmurs in the twilight of life as mysterious as an overshadowed ocean, while the dazzling brightness of supreme hopes lies far off, fascinating and still, on the distant edge of the horizon.

Few men realize that their life, the very essence of their character, their capabilities and their audacities, are only the expression of their belief in the safety of their surroundings. The courage, the composure, the confidence; the emotions and principles: every great and every insignificant thought belongs not to the individual but to the crowd: to the crowd that believes blindly in the irresistible force of its institutions and of its morals, in the power of its police and of its opinion. But the contact with pure, unmitigated savagery, with primitive nature and primitive man, brings sudden and profound trouble into the heart. To the sentiment of being alone of one's kind, to the clear perception of the loneliness of one's thoughts, of one's sensations—to the negotiation of the habitual, which is safe, there is added the affirmation of the unusual, which is dangerous; a suggestion of things vague, uncontrollable, and repulsive, whose discomposing intrusion excites the imagination and tries the civilized nerves of the foolish and the wise alike.

—*Conrad*

Ophthalmologic and Otolaryngologic Surgery

Logical Use of Orthoptics

EDMUND B. SPAETH, M.D., F.A.C.S., F.I.C.S., D.A.B.
PHILADELPHIA, PENNSYLVANIA

THE intelligent use of orthoptics, basically an invaluable technic in the treatment of oculomotor disturbances, is dependent upon a knowledge of the development of a single binocular vision and the physiologic function that makes it possible to maintain single binocular vision under normal circumstances. Equally important is an understanding of the basic faulty physiologic picture of comitant strabismus and those secondarily developed attributes which result in the oculomotor deviations, as well as the characteristic deviations that identify noncomitant strabismus.

There is no doubt whatsoever that there are several different basic causes of comitant strabismus; these, in their principal characteristics, being quite different one from the other. Because of this fact (and clinically it is confirmed every day) there are different types of comitant strabismus resulting from these different causes. One might say there are as many different varieties of comitant strabismus as there are possible causes. It hence follows logically that the pathologic physiologic picture in cases of strabismus, while peculiarly characteristic for each causative factor, can be and is different in the varied types.

The medical treatment of strabismus, which includes the utilization of orthoptics, was started long before the pathologic physiology of strabismus was known; in fact, the principles underlying the development of single binocular vision were not known. This is very evident when one reads about procedures and the various appliances recommended at that time. A reference appears in an Egyptian papyrus dated about 1650 B.C. This reference was quoted as authoritative in a medical manuscript of the Byzantine middle ages, written by a physician who lived between 625 and 690 A.D. Paré, eight hundred years later, continued recommending the same methods of treatment. Buffon, in 1743, presented the first attempt to explain the cause of strabismus upon the bases later expanded by Donders and Helmholtz. Parinaud, in 1903, was the first to comprehend the relation of the central nervous system to squint, and Claude Worth, in 1929, in the first edition of his work on the treatment of strabismus, presented a working basis upon which modern orthoptics could develop.

The names of many workers have been omitted in this very sketchy history of strabismus as related to orthoptics. This omission does not belittle their contributions, however, in any way. Maynard C. Wheeler, in [illegible] d beautifully

---

Read at the Twentieth Annual Congress of the United States and Canadian Sections, International College of Surgeons, Philadelphia, Sept. 12-15, 1955.
Submitted for publication Oct. 15, 1955.

and compactly a history of orthoptics which should be known in detail by every ophthalmologist.

To paraphrase Giles,[2] the knowledge of when to treat, what to treat and when not to treat, is the basis of this presentation. It is most unfortunate, but true, that orthoptics as a therapeutic procedure is being grossly misused at present—in fact, prostituted (in the true sense of the word) and is in danger of becoming discredited by many ophthalmologists as well as by the lay public because of this misuse, regardless of whether it is deliberate or due to ignorance. Those at fault include (and it must be said with shame) some ophthalmologists, as well as some practising orthoptists and orthoptic technicians who, through circumstances not always of their own making, are practising without the active guidance of an ophthalmologist. In addition, it can be said from observation that some optometrists capitalize this means of income production without knowing what they are doing or why they are doing it.

A brief detailing, at this time, of certain cases is convincing as to the statement just made:

1. A child aged 8, under the care of an ophthalmologist, was treated for two years in an institution orthoptic clinic with no change whatever in the oculomotor condition present. The child had convergent strabismus of about the same degree for near vision and for distance. There was no vertical component connected with the strabismus. The visual acuity was 6/6 in each eye. The child was alternately suppressing. There was no determinable single binocular vision of any degree, and refractive errors were negligible. This was a classic case of essentially alternating convergent strabismus.

2. A 9-year-old girl had visual acuity of 6/150 on the right and 6/6 on the left; disturbances in the ocular motility of the superior and inferior oblique muscles of the left eye; inadequate spectacles, and intractable amblyopia (a form of amblyopia rather characteristic of arrested development). There was no torticollis, and no defects in retinal correspondence were present. The case had been referred directly to the orthoptist by the child's parents, and she had eight months of orthoptic treatment by an orthoptic technician (self-employed), which included, at times, daily visits to the orthoptist, masks, partial occlusion of the spectacle lenses with white paint and black tape, and occlusion of the fixing eye for varying numbers of hours per day—a procedure of no value with this type of amblyopia and certainly of no value unless used as complete occlusion for certain definite planned periods.

3. An 8-year-old boy had alternating divergent strabismus, with marked overaction of both inferior oblique muscles and limitation in the elevation action of the superior rectus muscles, with alternate suppression and the barest rudiments of single binocular vision. He was under treatment for over a year by a physician and an orthoptist.

4. A girl 14 years of age had 6/6 and 6/60 vision; a combination of characteristics of accommodative and nonaccommodative comitant convergent strabismus; anomalous retinal correspondence, disharmonious in type. She was treated intensely for three months by an optometrist, with so much success in this retraining of retinal function that, without any change in the degree of manifest deviation, with no improvement in the suppression and amblyopia, and with the establishment of such a remarkable degree of so-called third degree fusion in the strabismus and with the extrafoveal retina, that one must wonder what will happen when horror fusionis occurs, as it almost

certainly will, when at the age of approximately 18 this young lady is no longer willing to continue cross-eyed and seeks surgical aid of her own volition because of the cosmetic blemish.

These 4 cases can be matched repeatedly in private offices and in hospital clinics, all originating from the same sources; all those concerned being equally at fault to a degree proportionate to their professional training, their probabilities, their possibilities and their capabilities for doing harm or good.

This discussion of the intelligent utilization of orthoptics, is not considering the treatment of the phorias as related to orthoptics. In making this statement I am fully aware, at the same time, of that poorly demarcated line of differentiation which exists, in diagnosis, between a phoria and a tropia. It almost seems that one situation is subjective and the other objective, the latter the monstrous child of the parent former. Certain truisms are basic. Convergence insufficiency exophoria and convergence excess esophoria are ideal oculomotor situations for the utilization of orthoptics, thus illustrating the therapy for a phoria.

Certain manifest oculomotor disturbances cannot respond to orthoptics because of their etiologic and anatomic nature. There are other conditions in which orthoptics had some value. A third group of cases exists in which orthoptics is of paramount importance in the treatment. Orthoptic procedures, as therapeutic procedures related to strabismus, have their ideal application in the correction of the residual phorias present after the best results obtainable in the correction of the deviated visual axes after logical operation. This is repeating what has just been said about the ideal application of orthoptics to the treatment of the phorias.

Another point of importance is that orthoptics, with the examinations and instrumentation related to this specialty, has an outstanding place in preoperative diagnosis, rather than in the role of the wholesale, hopeful, wishful-thinking panacea too often used preoperatively. The postoperative application of orthoptics has already been mentioned and reemphasized. This statement, which is in part a generalization, does not mean disregard of suppression and amblyopia, anomalies of retinal correspondence, faults of fixation and faults in prism convergence and/or prism divergence.

In many cases of squint there is a significant functional aspect; hence it is necessary, in the intelligent use of orthoptic procedures, to consider the age of the patient and to investigate his psychic makeup, as well as the attitudes of members of his family, parents, associates and acquaintances, playmates and teachers. The last-mentioned group is frequently at fault (another observation of sad experience), at times deliberately and at other times through ignorance, during this period of a patient's medical life.

While most responsible orthoptists eliminate patients with noncomitant strabismus in the horizontal, many, for reasons known only to themselves, do not reject those who have noncomitant strabismus in the vertical, that is, those with paralytic or paretic vertical components. There is a marked difference in the demands made normally upon the horizontally acting and the vertically acting muscles. There is a constant necessity for disjunctive movements in the horizontally acting muscles for both distance and near vision, but this does not apply to the vertically acting muscles. These must maintain a constant vertical parallelism between the two eyes, regardless of the level or the direction of gaze. Because of this, the amplitude for horizontal reflex binocular adjustment is flexible, with quite a breadth, while that for vertical binocular rity is inflexible and exacting, providing but little, if any, significant breadth—in both instances for the conditioning as well as the maintaining of a normal binocular balance. As Fink[3] said, "We have, therefore, in the vertical component a fixed relationship with a very limited range of reflex power of adjustment, while the horizontal component is endowed with great power of adjustability."

The horizontal noncomitant conditions to be promptly rejected for orthoptic treatment are the retraction syndrome, strabismus fixus, subtotal or total horizontal oculomotor paralyses, and the not uncommon horizontal comitant strabismus with an oblique muscle fascial sheath syndrome. In many cases of horizontal comitant strabismus there is malfunction of the vertical muscles, and it is necessary to decide whether this vertical component is primary, paretic and the basic cause of the horizontal strabismus or whether it is secondary to the horizontal strabismus and basically not an etiologically responsible factor. It is lost time and a waste of money to attempt an improvement in any case of comitant strabismus in which a vertical component is paretic or paralytic. A vertical component need not be present in the amblyopic eye. The horizontal strabismus and the amblyopia develop in the eye with the higher refractive error because of the necessity for suppression due to the intractable diplopia of a constantly changing vertical deviation from parallelism. The uncovering of a vertical element and the diagnosis of the primary and secondary characteristics are therefore basic. It is necessary not only to make a diagnosis of the type of lateral strabismus present but to identify the vertical muscles involved. The presence of torticollis or of head facing is a manifestation of an etiologically significant vertical component (unless due to ocular nystagmus), as are also suppression of vision and amblyopia. Torticollis associated with horizontal strabismus is a manifestation of the patient's struggle against an intractable, etiologically significant, paretic type of vertical component, and the necessity for suppression, with its subsequent train of faulty retinal physiologic characteristics.

It is rather interesting that in cases of accommodative strabismus with a vertical component this vertical disturbance seems to appear rather late in childhood and is frequently encountered in patients in whom the major portion of the lateral strabismus is corrected by proper nonsurgical treatment. One might think that orthoptic procedures for the accommodative strabismus would also cure or at least prevent this vertical muscle spasm, if the assumption is correct that the vertical deviation in these cases is the result of the convergence excess and the accompanying circumstances, anatomic, physiologic and neurologic. It is rather likely that the assumption is correct. Nevertheless, this type of muscle spasm will not always respond to orthoptic treatment. It may become as much a surgical component of accommodative strabismus as is that portion of the horizontal strabismus which remains under full atropinization after correction of the suppression, the amblyopia and the anomalies of retinal correspondence.

Earlier in this presentation, comitant strabismus was roughly divided into three classes on the basis of their applicability to the use of orthoptic treatment. The first of these is that group of cases (again speaking only of comitancy in the horizontal and the vertical) of functional defect types, as one sees with alternating convergent or divergent strabismus. Alternate suppression is present without amblyopia. The angle of deviation varies but little, whether measured objectively or subjectively; it is approximately the same for near vision and for distance, and refractive errors are not etiologically significant. Anomalies of retinal correspondence are rare. Associated with this condition is a profound defect in ability to develop binocular single vision, which is at times entirely absent and at other times barely present. The characteristics of this type of strabismus have a basic individuality; therefore, orthoptics can have no preoperative place in the treatment and is of value only postoperatively, if at all. This doubtful value depends upon that modicum of binocularity which may be present, and because of this upon the presence of faulty physiologic changes peculiar to that possible state.

The condition is the extreme opposite of that which justifies orthoptic treatment of the phorias. For the moment, the term "fusion" is to be considered an adjective describing the degree to which binocular single vision has developed as a reflex. Thus, a fusional attribute or reserve makes possible the utilization of orthoptics for patients with the phorias. Adjective or noun—cerebral function or conditioned reflex—regardless of what it may actually be, its absence nullifies the applicability of any orthoptic procedure.

The second group consists of those conditions for which orthoptic procedures are of great value but not of paramount importance. This group is a large one, including types of so-called accommodation in which the squint decreases or disappears at near vision, with relaxation of accommodation-convergence. It is the strabismus of Buffon, of Donders, of Helmholtz, of Worth and of Maddox. The etiologic stages in its development are potentially reversible, and through that process binocular single vision (with utilization of the macula in each eye) is theoretically possible. Refractive errors are etiologically significant; hence their correction is basic. The secondary characteristics are suppression, amblyopia, anomalous correspondence and, probably, some late muscle fibrosis. I shall say more about this a little later.

The application of orthoptics is to the correction of these conditions. The three mentioned, suppression, amblyopia and retinal correspondence defects, are so interrelated that, in the majority of cases, correction of one means correction of the others. It is not only cruel but stupid to hammer at a 5-year-old patient because of an anomaly of retinal correspondence without first overcoming the suppression. Similarly, so-called retinal massage, whirligig machines and to-and-fro alternating machines have doubtful value. They are too frequently tolerated stolidly but produce no therapeutic results. Suppression must be broken up first. The basic essential is occlusion of the nonstrobotic eye. If alternation develops as a result of this, well and good. In many cases of accommodative strabismus these are surgical indications, and this development may present one such situation. Mention has been made of the vertical component of accommodative strabismus. This is always an indication for surgical treatment, and similarly so, frequently the condition is consequent to the horizontal deviation. The other surgical aspect is probably connected with the muscle fibrosis mentioned and is that degree of strabismus, usually greater for distances than for near vision, which remains uncorrected after these etiologically significant characteristics of accommodative strabismus have been corrected.

The third type of strabismus, and that with the strongest relation to orthoptics, is that in which there is a minimal accommodation-convergence relation. There are frequently profound retinal physiologic defects. This type of strabismus ranges from convergent to divergent deviations through the insufficiencies and the excesses of abduction and add [illegible] in many instances, the inadequacy of the accommodation-convergence theory. Strabismus of this variety is an innervational disorder due to faulty development of the central nervous system in which the primary visual centers have failed to control the functions of convergence and/or divergence, with resulting faulty binocular vision. The patients in these cases need most careful preoperative studies by the orthoptist. (The orthoptic correction of secondary characteristics and the postoperative application of orthoptics have already been described and lauded as applicable to the phorias.) Postoperatively, these patients are for a time in a No-Man's-Land of esophoria and esotropia, or exophoria and exotropia, and it is at this stage that orthoptics has its greatest value, unless one is to be satisfied with cosmetic improvement as the basis of treatment.

A last group of cases must be mentioned, in which the only value of orthoptics is correction of the suppression (when present) if it is possible to establish, by operation, a vertical and a horizontal comitance. This type includes the strabismus associated with various mechanical anomalies, such as muscle excursion defects, faulty tendon insertions, the etiologically significant vertical muscle faults, disturbances of the fascial sheath and the abnormal action of any or all muscles involved, such as various subtotal limitations in vertical and horizontal oculomuscular motility, paralytic or otherwise. The development of binocular single vision depends upon the possibility of establishing comitance. The prognosis for such perfection is doubtful. Orthoptics, therefore, in this type of case can have little value. It seems interesting that this basic fact is not believed by many of the persons concerned.

SUMMARY

The author emphasizes the fact that orthoptics as a therapeutic measure is grossly misused, quoting Giles[2] as to the importance of knowing "what to treat and when not to treat," and is therefore in danger of becoming discredited. He cites a number of cases in evidence. Legitimate uses of orthoptic methods are also pointed out.

ZUSAMMENFASSUNG

Der Verfasser betont, dass die Anwendung mechanischer Übungen des Auges als therapeutische Massnahme grob missbraucht wird und zitiert Giles,[2] der sagt, wie wichtig es ist zu wissen, "was man behandeln soll, und wann man nicht behandeln soll." Die Methode ist in Gefahr diskreditiert zu werden. Der Verfasser führt eine Reihe einschlägiger Fälle an und weist auch auf die gerechtfertigten Anwendungsmöglichkeiten der mechanischen Augenübungen hin.

RIASSUNTO

L'autore mette in rilievo il fatto che la terapia ortottica è spesso male impiegata, e cita Giles a proposito della importanza di sapere ciò che si deve e ciò che non si deve fare. Il metodo deve essere impiegato con criterio.

RÉSUMÉ

L'auteur souligne le fait que les méthodes d'orthopédie, comme mesure thérapeutique, sont grossièrement abusées par la profession. A cet effect il cite Giles, concernant l'importance de savoir "ce qu'on doit traiter et quand on ne doit pas traiter," s'il on veut que l'orthopédie ne perde pas son prestige. Il présente aussi un nombre des cas et il énumère une sérvie des méthodes orthopédiques.

SUMÁRIO

O autor cham a atenção para o fato de que a Ortoptica como medida terapeutica é muitas vezes mal empregada e cita? Giles quanto à importancia de saber "o que tratar e quanto não tratar," havendo portanto o perigo de que a mesma entre em discredito. Apresenta varios casos. São indicados os usos legitimos dos metodos ortopticos.

REFERENCES

1. Wheeler, M. C.: History of Orthoptics, Am. J Ophth. 25:569, 1942.
2. Giles, G. H.· The Practice of Orthoptics. London: Hammond Hammond & Co. Ltd., 1945.
3. Fink, W. A.: Trans Sect. of Ophth A M A 1951, p. 146.

Jenner's best memorial occurs in Queen Victoria's diary. His greatest patient was no expert in medical philosophy, but she was a very good judge of men, and she admired this robust and independent doctor. "Much grieved to hear that good old Sir William Jenner, who had been for so many years (from '61 to '93) my physician, had died this afternoon. He had been a most devoted and faithful servant of mine, a most able doctor, and a truly kind friend, to whom I could always speak frankly and confidentially. I have greatly missed him during the last five years, when he could no longer come to see me. He had been with me during the saddest moments of my life, having been most kind and attentive at this most terrible time, now thirty-seven years ago: again at Sandringham, during Bertie's most alarming illness in '71, and when dear Leopold was so dreadfully ill on two occasions, and Sir William, under Providence, really saved his life. On many other trying and sad occasions he showed much kindness, and was always full of sympathy, though naturally of rather an irascible temper. He gave up travelling with me after the year '79, never going any more either abroad or to Scotland. It is another link with the past gone, and I feel it very much."

—*Williams*

The Ridley Intraocular Acrylic Lens Operation[*]

Comments and Modifications

RICHARD A. PERRITT, M.D., F.I.C.S., D.A.B.
CHICAGO, ILLINOIS

EXTRACTION of the cataractous lens, even with the most expert surgical technic and the most nearly perfect cosmetic result, is but half the treatment for the patient. The problem of treating induced aphakia is still unsolved. No aphakic lens is manufactured, even among those of the latest optical patterns, that can supply the answer. Contact lenses are useful to some patients, but even these only reduce the size image of the aphakic eye by one-half, leaving a disparity of image size amounting to about 15 per cent. The cure for cataract will be complete only when the important portion of the eye (the lens) is replaced within the eye and the patient thus obtains single binocular vision. The aphakic glasses available at present produce spherical aberrations, distortions and a limited field of vision, to say nothing of the patient's complete inability to perform ordinary tasks, such as shaving, walking and eating, without the aid of glasses. Because of the enlargement of the image, the visual acuity in cases of aphakia is considerably less than is indicated by the usual clinical tests.

In 1951 Ridley developed his intraocular lenticulus operation. My experiences with this procedure over a period of almost three years leads me to the following practical conclusions:

1. I have discarded the preoperative use of homatropine or any other cycloplegic drug and now use 4 per cent cocaine and epinephrine 1:1000 instilled in three doses and followed by retrobulbar injection of 1 per cent procaine in hydrochloride (hyaluronic acid). This enhances the mydriasis produced by cocaine. One must carefully gauge the mydriatic effect, so as to obtain a pupil measuring 5 to 6 mm. This is the optimum degree of dilatation both for extracapsular extraction and for placement of the lenticulus.

The response to pilocarpine at the termination of the operation is quite rapid and is enhanced by gently stroking the iris to produce more complete miosis. Profuse irrigation with saline solution will also aid in this process.

2. The peripheral iridectomy should be very small and placed at the point of attachment of the iris to the scleral spur.

3. The use of a sharp knife for a clean excision of the anterior capsule prevents accidental dislocation of the entire lens with an unintentional intracapsular extraction. Capsular tags should be excised, not pulled out with capsular forceps.

4. The lenticulus should be placed, gently but firmly, inferiorly behind the iris border. There is no fear of dislocation if it is kept in position with a spatula while the superior border of the iris is teased over it.

5. The pupillary border of the iris should be raised with a special iris elevator at the superior pole. The special iris needle employed by Ridley produces more traumatism and a greater release of iris pigment than does the smooth iris elevator.

---

[*] Operative technic shown in Kodachrome motion pictures at Geneva.

Read at the Twentieth Anniversary Congress of the International College of Surgeons, Geneva, May 6-10, 1955.

Submitted for publication Aug. 20, 1955.

6. At the end of the operation the iris should be stroked to stimulate even constriction of the pupil. One should make sure that the iris is not impinged upon, either at or near the chamber angle.

7. Thorough irrigation with physiologic solution of sodium chloride before and after insertion of the plastic lens is to be recommended, especially if the iris has been unduly traumatized.

8. The lens should be positioned *after* the iris has been symmetrically stimulated and the pupil is round and centered.

9. Milky white cataracts, intumescent and morgagnian cataracts lend themselves to this technic, particularly as with thorough lavage all cataractous particles are removed.

10. The subconjunctival injection of hydrocortone suspension (2.5 per cent) into the inferior cul-de-sac at the termination of the operation and the use of cortone or hydrocortone systemically has a tendency to prevent the formation of exudates on the anterior lens surface or the incarceration of pigment granules within it.

11. Pilocarpine 4 per cent, at the termination of the operative procedure is recommended.

12. Homatropine, 2 to 4 per cent or even atropine, 1 per cent, at the first dressing (twenty-four hours later), to prevent synechiae and obtain a 4 to 5 mm. pupil, is advised.

13. The acrylic lens prevents anterior displacement of the vitreous and reduces the incidence of retinal attachment and corneal edema.

14. A mobile pupil is an absolute prerequisite—free of all synechiae, especially those near the pupillary border. If synechiae following trauma are present, these adhesions should be severed prior to operation for cataract.

15. Monocular cataracts, particularly in young patients. These are particularly well adapted to this procedure.

16. *Monocular traumatic cataracts, provided the posterior capsular is not perforated.*

17. Juvenile mature cataracts, even if complicated by diabetes, provided the diabetes is well controlled medically.

Contraindications.—1. Intracapsular extraction should not be performed, because in a large percentage of cases there is luxation into the vitreous.

2. All complicated cataracts due to previous iritis, iridocyclitis or cataracta complicata where the posterior capsule is also involved in the cataractous process or when the posterior capsule has been perforated.

This was very forcefully demonstrated *in the case of W. U., aged 19, who suffered* a perforating injury to the eye due to an intraocular piece of steel. Within two weeks the acuity was reduced from 20/30 to 20/200, owing to a traumatic cataract. At the time of removal of the traumatic cataract, in May 1954, the procedure was complicated by adhesions to the cataract from the injured posterior capsule. This made delivery of the lens very difficult. It was because of this fact that I decided not to replace the traumatic cataractous lens with an acrylic lens.

Six months later there occurred a detachment of the retina. This justified my *judgment in not placing an acrylic lens* within this eye.

3. *Children with cataracts* (various forms of congenital or traumatic) under *the age of 12 should not have an acrylic* lens.

4. Eyes with intraocular tension within the higher limits of normal are prone to secondary increased intraocular t
Prophylactic treatment of such e
pilocarpine is

REPORT ON PATIENTS STUDIED AND FOLLOWED FOR ONE TO THREE YEARS

In the following synopsized report are presented the cases of 13 patients who were surgically treated for cataract, with use of the Ridley acrylic lens:

1. R. U., aged 34:
Diagnosis, left traumatic cataract at the age of 13.
3/11/53 Left cataract extraction (extracapsular) with acrylic lens implant.
4/17/53 *Right Vision:* 20/200
—3.00 + 0.50 axis 40 = 20/20
Left Vision: 20/200
—6.75 + 1.00 axis 150 = 20/25
5/17/55 At Nurnberg, Germany: Pupil mobile and centrally located; binocular vision.
Right Eye: —4.75 + 1.00 axis 75 = 20/20
Jaeger No. 1
Left Eye: —6.25 + 1.00 axis 105 = 20/25
Jaeger No. 1 slowly

2. A. B., aged 45:
Diagnosis, presenile cataracts in both eyes of two years' duration.
Right Vision: 20/100 No Jaeger
Left Vision: 20/300 No Jaeger
9/30/53 Left cataract extraction (extracapsular) with acrylic lens implant.
Left Vision: 20/50
+2.75 + 2.25 axis 172½ = 20/25 + 2
2/17/54 Right cataract extraction (extracapsular) with acrylic lens implant.
Right Vision: 20/80
+3.75 + 0.75 axis 20 = 20/20 —3

3. C. H., aged 68:
Diagnosis, senile bilateral cataracts with slight increase in intraocular tension in both eyes, controlled with miotics.
9/23/53 Right cataract extraction (extracapsular) with acrylic lens implant.
Right Vision: 20/200
—9.25 + 6.00 axis 27 = 20/15
Left Vision: 20/200
—6.00 + 4.00 axis 105 = 20/200

4. W. A., aged 49:
Diagnosis, presenile cataracts in both eyes.
5/22/53 Right cataract extraction (extracapsular) with acrylic lens implant.
Right Vision: 20/200
—6.00 + 2.00 axis 180 = 20/25 —3
7/14/54 Left cataract extraction (extracapsular) with acrylic lens implant.
Left Vision: 20/100
—7.50 + 1.00 axis 2½ = 20/30 + 2

5. J. M., aged 30:
Diagnosis, traumatic cataract in the left eye with multiple foreign bodies embedded in the cornea and on the anterior surface of the iris at 5, 6 and 7 o'clock. Calcareous changes in the anterior capsule.
4/27/53 Iris adhesions severed at 6 o'clock. After the use of a sharp cystotome, the calcareous capsule was removed with capsule forceps, the calcareous lens removed and the remnants thoroughly irrigated. There were some adhesions on the temporal side of the iris, but this did not prevent placement of the acrylic lens.
Right Vision: 20/80
+ 1.50 + 4.00 axis 100 = 20/20
Left Vision: 20/50
— 3.25 + 1.50 axis 140 = 20/20

6. M. T. S., aged 55 (Negro):
November, 1952
Diagnosis, right cataract extraction (extracapsular) with acrylic lens implant.
Right Vision: 20/80
+ 2.00 + 3.00 axis 180 = 20/20
Left Vision: 20/50
+ 2.00 + 2.00 axis 180 = 20/25

7. W. B., aged 65:
Diagnosis, bilateral senile cataracts.
10/7/53 Left cataract extraction (extracapsular) with acrylic lens implant.
Left Vision: 20/100
Plano + 2.00 axis 60 = 20/80 — 2

8. A. W., aged 22:
Diagnosis, diabetes since the age of 10. Utilized 40 units of insulin for past eleven years.
A true juvenile (18 to 25 years) diabetic cataract is not a contraindication, even though the posterior capsule may be partially involved in the cataractous process, particularly if the diabetes is well controlled and the patient is properly prepared medically.

This patient had a true diabetic cataract, as characterized by widespread and subcapsular changes, especially in the posterior cortex. These changes were bilateral and ran a relatively acute course. The cataract contained vacuoles interspersed with fine punctuate and flaky white precipitates, water clefts and separation of the sutures.

8/12/53 Left cataract extraction (extracapsular) with acrylic lens implant.

Left Vision: 20/80

— 3.25 + 2.75 axis 20 = 20/30

There was no undue reaction from the acrylic lens. The pupil is round and centered and mobile. There are no pigmentary exudates on the lens surface.

10/13/54 Right cataract extraction (extracapsular) with acrylic lens implant.

Subconjunctival injection—Hydrocortone, 2.5%

Right Vision: 20/60

+ 0.25 sphere........ = 20/25

9. B. P., aged 43:

Diagnosis, bilateral cataracts.

8/25/54 Left cataract extraction (extracapsular) with acrylic lens implant.

Left Vision: 20/100 — 2

—1.75 + 2.00 axis 65 = 20/30 — 3

FAILURES AND THEIR EXPLANATIONS

1. C. H., aged 68:

Nine months from the time an excellent *immediate result had been obtained (vision* improved 20/15), after a long automobile trip, the patient suffered complete dislocation of the lenticulus into the dependent portion of the eye. Its movement is slight and occurs only with extreme movement of the eye downward.

At first, the intraocular tension became elevated. This is now controlled readily with 2 per cent pilocarpine solution.

The aphakia is now convertible with the following formula: + 6.50 — 3.75 axis 22 equals 20/15: Add + 2.50 equals Jaeger No. 1 at 16 inches. The lens has been well tolerated and has produced no further signs of irritation.

This patient laments the loss of "normal" ocular function — normal peripheral fields. Use of the naked eye for shaving, etc., and the many other functions he possessed with the acrylic lens, even though at the time of writing his visual acuity by the usual standards is again 20/15 with Jaeger No. 1 at 16 inches.

2. W. B., aged 65: Exudate on the anterior lens surface and excessive iris pigment have produced dense posterior synechiae and reduced unaided vision to 20/100. Vision is not improved with a refraction.

In retrospect, I am convinced that (a) irrigation was not done as thoroughly as necessary after insertion of the lenticulus and (b) homatropine was not instilled early enough, and 10 per cent neosynephrine produced no effect on the synechiae.

3. A. A., aged 51:

[illegible] Right cataract extraction (extracapsular) with acrylic lens implant.

February, 1953

Right Vision: 20/50

— 2.00 + 1.75 axis 150 = 20/25

Left Vision: 20/50 + 2

— 1.75 + 1.75 axis 5 = 20/15 — 1

The anterior lens surface was clear, but inferior temporal portion of the iris impinged on the groove of the lens. In April it was decided to separate these adhesions on the lens groove with a sharp spatula, but the adhesions proved very dense and difficult to separate. In October the proliferative membrane over the lens surface had become dense with secondary glaucoma and edema of the corneal epithelium and stroma. Vision was reduced to finger counting at 1½ inches. In November the pupillary portion of the dense membrane was incised and excised. The central portion of the lens was clear. At the time of writing the corneal edema is absent and the intraocular tension normal.

Right Vision: 20/200

With pinhole 20/80

Comments.—This demonstrated to me that if the posterior capsule is uninjured and the lens properly centered, the dense fibrous tissue formed even after three to four months is so firm that it is practically impossible to separate the acrylic lens from its enmeshment in fibrous tissue.

retrospect, my judgment was fault.
cause the lens would not
lodged even though the
had become attached to
lens.

4. O. A., aged 59:
   Diagnosis, senile cataract of left eye. This patient was operated on elsewhere. She stated that during removal of the corneoscleral sutures "some water ran out of the eye." The anterior chamber was lost and dense anterior synechiae formed, with obliteration of the anterior chamber from 12 to 3 o'clock and secondary glaucoma associated with corneal edema.

CONCLUSION

Although the Ridley lens may not be the final answer to the problem of aphakia, it is certainly an ingenious step toward attainment of the desiderata: single binocular vision, good peripheral vision and useful vision without glasses.

With further improvement in the manufacture of the acrylic lens, so that the specific gravity of the lens (now 1.9) is equal to that of the aqueous (1.03), dislocation of the lens will be practically eliminated.

Farther on the horizon I can see the time when these lenses will be ground according to the specific dioptic needs of the aphakic patient.

ZUSAMMENFASSUNG

Der Verfasser berichtet üben den augenblicklichen Stand der Technik mit der Ridleyschen Akryl-Linse. Er beschreibt die zu ihrer Einsetzung notwendigen Handgriffe und führt die Indikationen und Gegenindikationen an. Die Arbeit enthält einen Bericht über eine Gruppe von Kranken, die ein bis drei Jahre lang nachuntersucht wurden.

SUMÁRIO

O Autor discute a lente intra-ocular acrilica de Ridley, bem como a operação necessaria para aplica-la, incluindo algumas modificações neste processo. São apresentadas asindicações e contra-indicações, bem como 12 casos, em 3 dos quais houve falha do tratamento. O A. explica estas falhas com base em sua experiencia e apresnta suas recommendações quanto ao tratamento dos pacientes.

RIASSUNTO

L'autore descrive l'impiego della lente acrilica intraoculare di Ridley con qualche modificazione sul metodo originale. Ne elenca indicazioni e controindicazioni e riferisce su 12 casi personali con 3 insuccessi. Questi ultimi vengono giustificati.

RÉSUMÉ

L'auteur parle de la lentille acrylique intraoculaire et de l'opération spéciale pour son application. Il y ajoute quelques modifications et il y énumère les indications et les contre-indications de cette opération en présentant douze cas opérés parmi lesquels trois étaient un échec.

L'auteur fait une analyse de ces échecs opératoires et il fait, en se basant sur son expérience, des recommandations concernant la manière de traiter ces patients.

BIBLIOGRAPHY

Arruga, A.: Arch. Soc. oftal, hisp.-amer. 11: 1490, 1951; Rev. esp. Oto-neuro-oftal. 11:255, 1940.

Arruga, H.: Bull. Soc. franc. Ophtal. 65:423, 1952; Clin. y Lab. 55:17, 1952; Personal communication, 1953.

Bain, W. E. S.: Proc. Roy. Soc. Med. 45:29, 1952.

Cavara, V., and Ciotola, G.: Boll. Oculist. Paris 32:129, 1953.

Miller, H. A.: Ann. Oculist. Paris 186:312, 1953.

Reece, W.: J.A.M.A., to be published.

Ridley, H.: Trans. Ophthal. Soc. U. K. 71:617, 1951; St. Thom. Hosp. Rep. Second Series 7:12, 1951; Lancet 1:118, 1952; Brit. J. Ophthalmol. 36: 113, 1952; J. Internat. Coll. Surgeons 18:825, 1952; Trans. Am. Acad. Ophthalmol. & Otolaryngol. 57:98, 1953.

Vanrell, F. A., and Diaz, P. C. T. R.: Dia. med. Uruguay 20:235, 1953.

Orthopedic Surgery

Flat Feet and Lateral Rotation of Legs in Young Children

J. HIRAM KITE, M.D., F.A.C.S.

ATLANTA, GEORGIA

MANY articles have been written on the treatment of flat feet. Little has been written about their prevention. Present-day medicine and surgery are as much concerned with the prevention of disease and disabilities as with the cure. If flat feet are to be prevented, the cause must be known.

There is a small group of cases in which the flat foot deformity is truly congenital. In these one encounters severely deformed feet, which look almost like reversed clubfeet. The talus points medially and toward the sole. This deformity, like other congenital deformities, is present at birth and is easy to diagnose, but it is very difficult to correct. This type will not be considered here.

This paper will deal with the large group of flat-footed children who are seen daily by pediatricians and by orthopedists interested in children. The mother notices, when these children begin to pull up and stand, that the feet turn outward and have no arches. It is usually assumed that such children have inherited flat feet from one or both parents and that nothing could have been done to prevent it.

Not all children are flat-footed. Some children have normal feet, and still others are pigeon-toed. Children brought for treatment usually fall into one of two patterns: One group has "medial torsion of the legs" and is pigeon-toed; the other has "lateral torsion of the legs" and is flat-footed.

Etiologic Factors. — During the first four months of life, when the baby cannot turn over, he may spend most of the time in the same position. Both of the aforementioned groups sleep on the abdomen. The babies with medial torsion and pigeon-toe deformity sleep in the knee-chest position, with their knees drawn up under them and their hips up in the air. The weight comes on the feet, which are turned in. At other times they may sleep with the legs extended, but with the feet turned in. Babies with lateral torsion and flat feet sleep on the abdomen with t legs abducted 90 degrees into a frog o eagle" position. The babies who and sleep in both positions may h mal rotation of the leg

The fetus, which l *amniotic fluid before*

Read at the Twentieth Annual Congress of the United States and Canadian Sections, International College of Surgeons, Philadelphia, Sept. 6-10, 1955.

Submitted for publication Sept. 19, 1955.

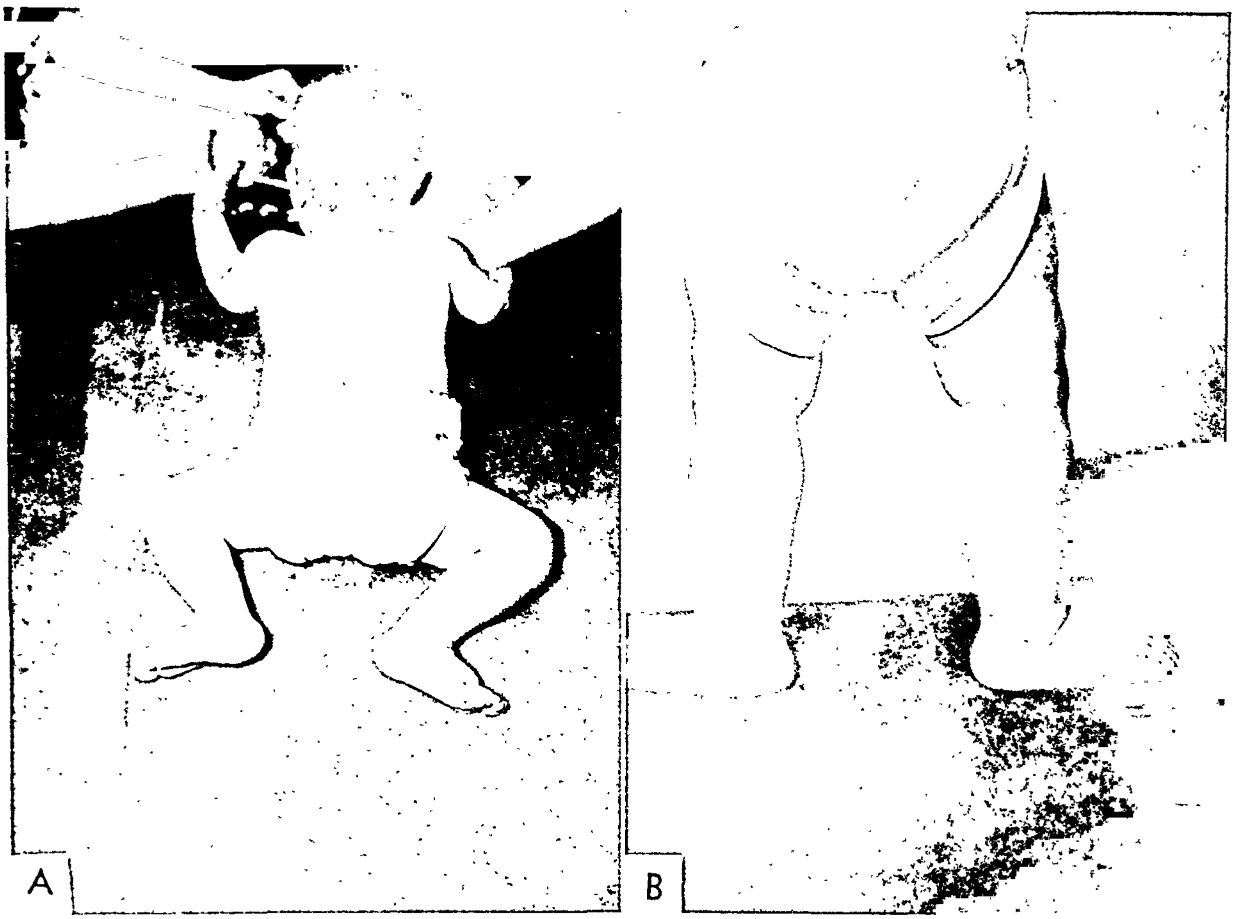


Fig. 1.—*A*, baby placed in frog position. In this attitude the legs are rotated laterally ninety degrees. The great toe rests on the mattress forcing the forefoot into abduction. Sleeping constantly in this position produces lateral rotation of the legs and flat feet. *B*, characteristic standing position of the child shown in *A*. There is fixed lateral rotation in the hips, so that the patellas and toes point outward nearly ninety degrees.

birth on a firm mattress. A new, stiff and much too large diaper is applied, holding the legs in abduction, almost like the pillow used in the treatment of congenital dislocation of the hips. If the baby is placed on either his abdomen or his back, the legs are abducted to a right angle with the trunk. The knees are flexed, rolling the legs laterally 90 degrees at the hips (Fig. 1*A*). The anterior surface of the thigh is not in line with the anterior surface of the abdomen, as it would be if the legs were in full extension. The anterior surface of the thigh is rolled outward 90 degrees, and the medial surface of the thigh is on the mattress. As the months go by, the ligaments about the hip become contracted and hold the legs in this laterally rotated position.

This position also causes certain changes in the feet. The great toe rests on the mattress, turning the fore part of the foot out in abduction. The fore part is abducted as far as it will go in the midtarsal joint, and then it pulls the posterior portion of the foot out in eversion. There is no paralysis of the muscles of the leg, but the peroneal muscles gain strength by being in a shortened position. They pull in a direct line, which gives them a mechanical advantage. The tibial muscles are slightly weakened by being stretched. They work at a mechanical disadvantage by having to pull from around the corner. The foot is more frequently pulled out and upward in a calcaneovalgus position. The fore part of the foot may be actively adducted to the midline but is not inverted as strongly as it is everted. It seems logical to assume that this froglike position maintained day and night for the first four months and often for months longer, is the chief cause of lateral rotation of the legs and flat feet.

The baby old enough to sit who sleeps in a knee-chest position will flex his knees and sit back on the lower parts of his legs, with his feet turned in. If he has outward rotation of the legs he will sit tailor fashion, with his thighs still rotated laterally.

When the child who has slept in the frog position is old enough to pull up and stand, the legs are each rotated laterally, so that the patella as well as the toes point outward about 90 degrees. It might be said that "one foot goes east and one goes west" (Fig. 1*B*). The child will walk with his legs rotated half way between the limits of lateral and medial rotation. Therefore, he will place his feet in about 45 degrees of abduction.

Rotation Test. — If one examines the baby while he is lying on his back, one can tell which way he has slept during his early life. This is done by grasping the legs near the knees and rolling the legs medially and laterally. If he has slept in all positions, the patellas can be turned medially and laterally about the same distance from the midline. If he has slept in the knee-chest position, the patellas can be turned medially 90 degrees but cannot be turned outward much past the midline. If he slept in the frog position, the patellas can be rotated laterally at least 90 degrees (Fig. 2*A*) but cannot be rotated medially much past the midline (Fig. 2*B*). The limitation to rotation is in the

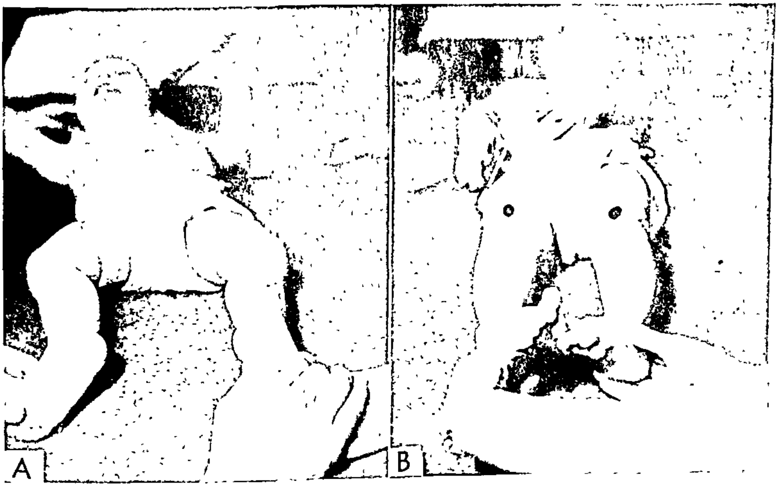


Fig. 2.—*A*, rotation test. This same child's legs can be rotated laterally in the hips more than 90 degrees, so that patellas and toes point outward. *B*, same child's legs are rotated medially. When this is done, they can be turned in until the patellas point straight forward, but cannot be forced inward any further.

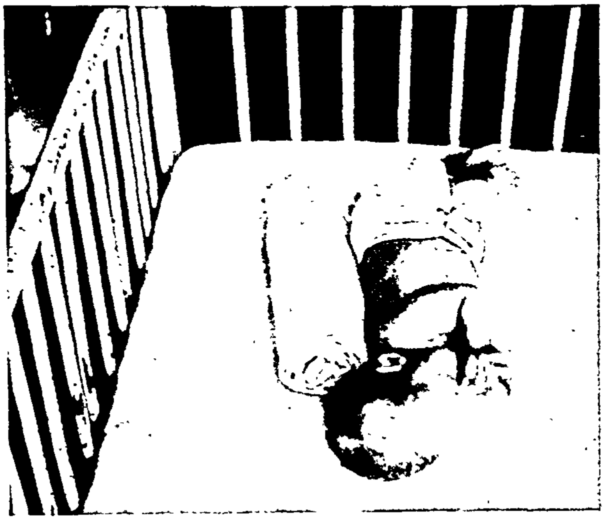


Fig. 3.—Baby encouraged to sleep on his side by placing a rolled up baby blanket as a support against his shoulder and hip.

hips and is due to contracture of the ligaments about the hip joint.

Prevention of Flat Feet — If this theory is correct, flat feet in many cases are produced by the position in which the baby has slept, this deformity can be prevented by keeping him from sleeping in the same faulty position all of the time. The best position for sleep, as far as rotation of the legs is concerned, is on the side (Fig. 3). When the baby lies on his side the anterior surface of the thigh and the anterior surface of the abdomen are in the same plane. This is true for the upper part of the leg as well as for the lower.

After the child has been sleeping for some time in the same position, this becomes his "position of comfort," and he dislikes to change positions. If he is started sleeping on his side immediately after birth he does not have to make the change. He can be encouraged to sleep on his side by placing a pillow or support against his shoulder and hip (Fig. 3). A baby blanket may be rolled up like a log and used as a support. The baby is changed from side to side after each feeding.

Treatment. — Formerly, when these children were old enough to walk and it was noticed that they were flat-footed they were ordered "swung-in" shoes, which were expected to correct the deformity. It was only in cases of very mild involvement that the swung-in shoes were successful. It was evident that something more was needed if these children were to walk with their toes pointing straight forward.

For the past seven or eight years I have been carefully teaching mothers to do two things, which I have found to be very helpful. Since lateral rotation of the legs is due to a fixed contracture of the ligaments about the hip joint, one cannot expect the child to overcome this lateral rotation by simply applying a shoe that holds the forefoot in slight adduction. The mothers are first taught to grasp the child's knees and to rotate his legs medially in the hips, as far as they will go com-

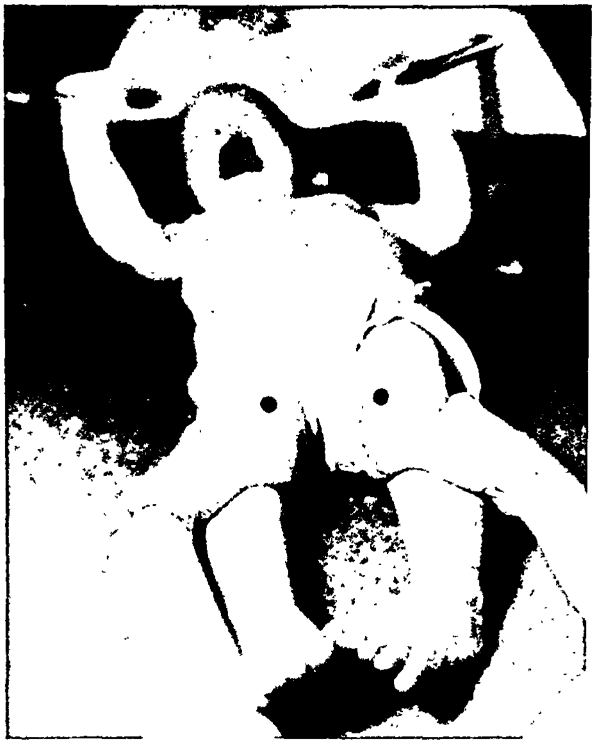


Fig. 4.—Lateral rotation is treated by having the mother grasp the knees and rotate the legs medially as far as they will go comfortably, and to hold them in this position for half a minute. After a few seconds rest, this procedure is repeated.

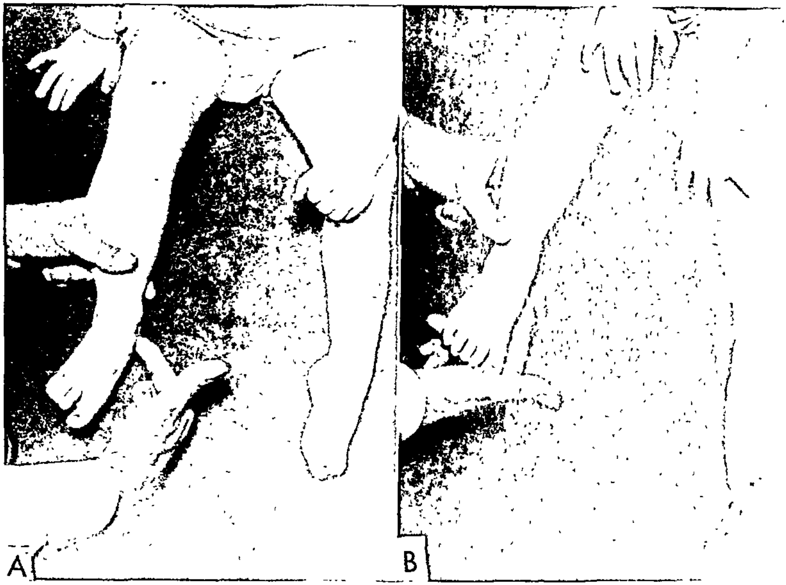


Fig. 5.—*A*, a good way to hold the foot to treat the flat foot deformity is to begin by placing the index finger on the tubercle of the navicular. *B*, the ball of foot resting on the mother's flexed thir finger.

fortably, and to hold them in this position for half a minute (Fig. 4). They are encouraged to count slowly to thirty. They are told that there is no virtue in the number thirty, but that there is virtue in holding the hips stretched medially for a long time. It seems that a long stretch does more good than a few short wiggles of the leg. The leg is released for a few seconds of rest and the stretching repeated. It is passive stretching and not active exercise. Several minutes are spent doing this.

The second procedure is to treat the flat-foot deformity. The mother is shown how to hold the fore-part of the foot and the heel, so as to turn the forepart down in plantar flexion and in adduction, and how to invert the heel and restore an arch to the foot. This turns the foot farther in than does the swung-in shoe and also farther than the child does in his movements of the foot. The success of this procedure depends entirely upon how well the doctor teaches it to the mother. The doctor should determine by trial and error the best way to hold the foot, and then teach this to the mother in the easiest way for her to learn. After teaching this procedure to about 500 mothers, I have found the following method to be good.

Since most mothers are righthanded, it is easier to start with the right foot first. With the child on his back on the examining table and the mother facing the feet, she begins by placing the index finger of her right hand on the tubercle of the navicular bone (Fig. 5*A*). This is described to her as a pea-shaped bone on the medial side of the foot, halfway between the base of the great toe and the heel. If the forefoot is in abduction she can see and feel it better. If she is in doubt about having the finger on the right bone, she can move her finger backward and forward, and feel the finger slip off and on the bone. With the index finger on this bone, the flexed third finger is under the ball of the foot (Fig. 5*B*). The thumb comes on top of the great toe (Fig. 6*A*). This gives her a good grasp of the forepart of the foot. The child's heel is placed in the middle of the palm of the left hand, and a firm grasp is taken on the heel (Fig. 6*B*). The middle finger of the left hand is placed on top of the tip of the index finger of the right hand, giving a little more pressure on the tubercle of the navicular (Fig. 6*C*). With gentle but firm pressure she inverts the heel, carries the forepart of the foot inward toward the other foot, and restores a longitudinal arch to the foot. She bends the foot as if she were bending a wire. The foot is held in this position for half a minute and released. She is taught to push the tubercle of the navicular bone straight into the side of the foot and not upward. In correcting flat feet by casts, I have found that the correction can be obtained more quickly when pressure is made on the side of the tubercle of the navicular bone, pushing it into the foot, rather than by pushing upward on the navicular bone. The mother is cautioned not to turn the foot loose, thus rewarding the child for struggling, but to be gentle and to continue holding the foot. After a little while the child will realize that it does not hurt and that he is not going to get loose. He will then let his mother hold the foot without too much objection. She is urged to make it a part of the daily routine, so as not to forget it. It may be done when she gives the baby his bath or puts him to bed. The mother is asked to spend ten minutes by the clock

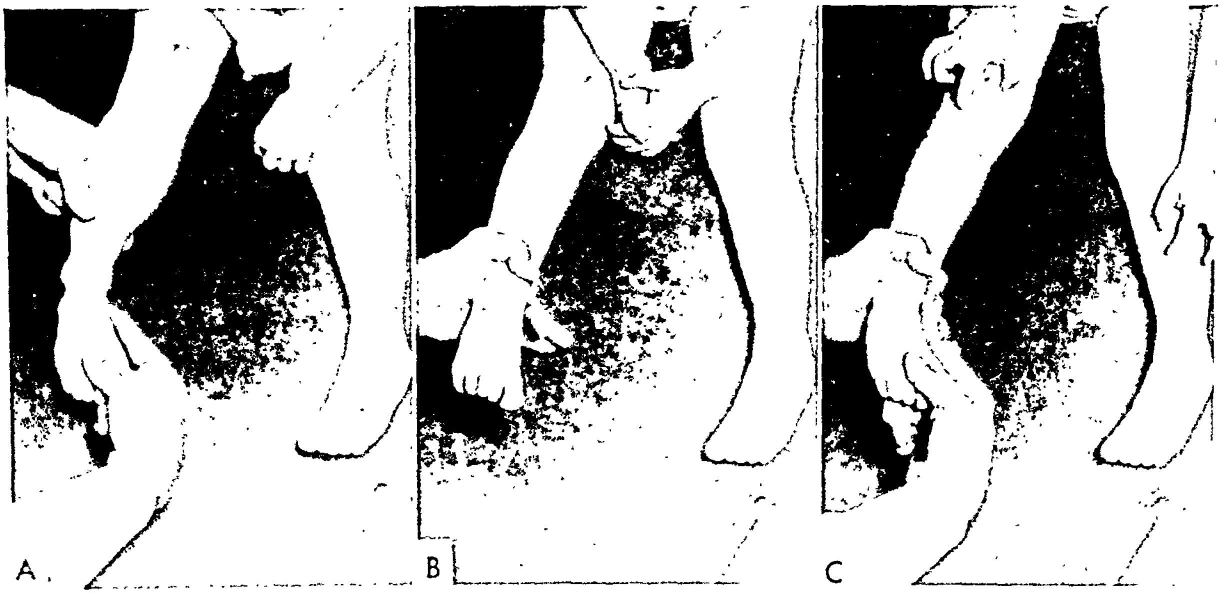


Fig. 6.—*A*, thumb is placed on top of great toe, giving a good purchase on the forefoot. *B*, heel placed in the palm of the other hand and a firm grip is taken on the posterior part of the foot. The heel should also be inverted to correct the valgus deformity. The third finger is raised to press on the top of the index finger, when the two grips are combined. *C*, when the two grips are combined, the forefoot is adducted, and pressure is made inward on the tubercle of the navicular, thus shifting the talus from a flatfoot position on the medial side of the foot to the lateral side of the foot.

twice a day on these three procedures, or about three minutes on the knees and the same on each foot. She is told that this stretching is the important part of the treatment.

Shoes. — Shoes are of secondary importance. They should be one of the many kinds of "swung-in" shoes on the market today. Years ago corrective shoes could be obtained only by being made to order. Today most of the large shoe manufacturing companies have a "corrective" shoe. They all have about the same features: The forepart of the foot is swung in, there is a long medial counter, and a Thomas heel with a lift of 1/8 inch (0.32 cm.) under the medial border. Some makes of shoes are heavier than others. The lighter shoes are better for the first pair and until the child begins to walk well. Then a little heavier shoe can be ordered. Some shoes are swung in more severely than others. For girls a medium-weight shoe is used. For boys and over-weight children the heaviest shoe is used.

A lift of more than 1/8 inch under the heel puts a strain on the ankle and foot and is not recommended for young children. I am very much opposed to a lift under the "little toe side" of the sole. This everts the lateral side of the forepart of the foot, depresses the arch, and throws the foot into a flat-footed position.

New shoes should be broken in gradually. If they are worn constantly, pressure may cause red spots on the foot and occasionally a blister. Failure to observe this point has caused some mothers to discard the corrective shoes. There is no virtue in high-topped shoes. except that they are more difficult for the child to remove. As soon as the manufacturers make corrective oxfords in the smaller sizes, they may be worn. When the child becomes older, he should be taught how to walk with his feet pointing straight forward and should be trained in the many exercises that correct flat feet.

About 90 per cent of feet will respond to the aforedescribed treatment when it is carried out regularly. For children who still toe out and children whose mothers will not stretch the feet, a bar can be placed across the shoes and worn at night to roll the legs medially. The bar should be bent toward the body to invert the ankles slightly. For the older child who still has a flat foot imprint, a rubber or metal arch support may be placed inside the shoe. I think of these as crutches and use them only in the cases of severe deformity that has not responded to the treatment described. My preference is for the metal support manufactured by the brace maker.

The patient returns for observation every three months. New shoes will be needed by this time. The mother is again checked as to her method of stretching and given further instructions as to how to do it more efficiently. When the child begins to wear the heels off more on the lateral border, he is approaching the time when he may have a shoe with no lift under the heel. He should not go barefoot until he walks with the feet straight, has a normal longitudinal arch when he stands and a normal imprint. Most children who have followed this routine will have normal feet by the third or fourth year. There are some extremely flexible or hypermobile feet that will always collapse into a flat-footed position. These should be held for a longer period, and later in life, if the foot is painful, an operative procedure may be needed.

SUMMARY

Lateral rotation of the legs and flat feet in a small child are caused by the child should sleep in various positions, in the frog position. To prevent this the child should sleep in various positions. preferably on his side. When the deformity is present, the lateral rotation is treated

by rolling the legs medially. The flat-foot deformity is corrected by stretching the fore part of the foot downward to restore the longitudinal arch to the foot. This is supplemented by swung-in shoes.

RÉSUMÉ

La rotation latérale des Jambes et les pieds plats des petits enfants sont causés par la coutume de l'enfant de dormir constamment sur l'abdomen dans la position grenouille. Pour prévenir cela l'enfant devait dormir en différentes positions, préférément sur le coté. Si la deformité est présente, la rotation latérale est traitée en tournant les jambes médialément. La deformité des pieds plats est corrigée en étendant la partie antérieure du pied en bas et en dedans pour restorer la voûte plantaire du pied. Cela est supplémenté par des souliers tournants en dedans.

RIASSUNTO

La rotazione laterale della gamba e il piede piatto, nei bambini piccoli, sono il risultato del fatto che essi dormono sempre sull'addome, nella posizione della rana. Per evitare questo inconveniente bisogna farli dormire in una posizione diversa, preferibilmente sul fianco. Quando la deformità si è stabilita, la rotazione della gamba deve essere trattata girandola all'-interno, mentre il piede piatto viene corretto stirando la parte anteriore del piede in basso e all'interno per ristabilire l'arco logitudinale del piede.

ZUSAMMENFASSUNG

Aussenrotation der Beine und Plattfüsse bei kleinen Kindern entstehen dadurch, dass das Kind ständig auf dem Bauche mit angezogenen Beinen (Froschschenkellage) schläft. Um solche Deformierungen zu vermeiden, sollte man die Kinder in verschiedenen Lagen, am besten auf der Seite, schlafen lassen. Ist die Entstellung bereits eingetreten, so wird die Aussenrotation durch Einwärtsdrehung der Beine behandelt. Der Plattfuss wird durch Streckung des Vorderteils des Fusses nach unten und innen korrigiert, wodurch eine Wiederherstellung des Längsgewölbes des Fusses angestrebt wird. Als unterstützende Massnahme werden einwärts gedrehte Schuhe verordnet.

SUMÁRIO

A rotação lateral das pernas e pés planos numa criança pequena são provodados pelo fato da criança dormir frequentemente sobre o abdomen, na posição de rã. Para evitar tal fato, a criança deveria dormir em varias posições, preferentemente de lado. Quando a deformidale existe, a rotação lateral é tratada promovendo-se a rotação das pernas medialmente. A deformidade do pé plano é corrigida forçando-se a parte anterior do pé para baixo e para dentro, para restaurar o arco longitudinal do pé, utilizando-se ainda sapatos adequados.

* * *

Men are wise in proportion not to their experience but to their capacity for experience.

—*Shaw*

Fractures of the Legs: Clinical Use of Alloplastic Bone Graft

ALEXANDER LICHTOR, M.D., F.I.C.S., AND JOSEPH LICHTOR, M.D., F.I.C.S.

KANSAS CITY, MISSOURI

AN earlier paper has described the use of a mixture of gelatin, formaldehyde and mineral salts to be of value experimentally in stimulating bone healing in animals. Briefly, the alloplastic material consists of the organic and inorganic fractions of bone. When formaldehyde is added to the mixture it solidifies and hardens (Fig. 1).

This material has now been used in the long bones and spines of 6 patients: 1 with established nonunion, 3 with delayed union, 1 with a fresh fracture and 1 with spondylolisthesis treated with an H graft of autogenous bone.

REPORT OF CASES

CASE 1.—J. W. B., a man aged 52, incurred an injury to the left leg on May 29, 1952, when it was struck by a metal pipe. The distal shafts of the tibia and fibula were fractured. Treatment elsewhere consisted of plaster cast immobilization plus Steinmann pins both above and below the fractures. After one month infection developed around the lower pin. The plaster and pins were removed and then replaced by a splint. A plaster cast was worn subsequently for two months.

He was first seen by us six months after the injury. Roentgenograms revealed established nonunion of a spiral fracture through the distal shaft of the tibia (Fig. 2). Weight bearing was painful, so that crutch support was required for ambulation. On Dec. 7, 1953, operation was performed. The fibula was first osteotomized, and then the tibial fracture was exposed. Scar tissue at the fracture site was excised and the bone curetted, the medullary cavity also being opened both proximally and distally. Alloplastic material was placed into the medullary cavity and externally about the fracture site. A single steel screw was placed across the fracture for internal fixation, and a long leg plaster was applied. Three weeks after the operation, when sutures were removed through a window in the cast, the wound drainage included some of the alloplastic material.

Two months after the operation the plaster was changed, and the operative wound was observed to be well healed. Immobilization was continued for a total period of nine months, at the end of which time the steel screw was removed and a short leg caliper brace fitted.

Roentgenograms were taken at monthly intervals. Bony union was apparent clinically and roentgenographically one year after the operation (Fig. 3). The patient was able to walk without cane or crutches. Some discomfort in the ankle, which is stiff, is now present after long walking.

CASE 2.—L. J. S., a 29-year-old man, sustained a compound fracture of the upper third of the left femur in a motor accident on April 17, 1953. He was treated elsewhere by im-

Fig. 1.—Pieces of alloplastic material. No porosity is produced by vigoro[illegible] beating [illegible]he material during i[illegible]ati[illegible]

Submitted for publication Aug. 4, 1955.

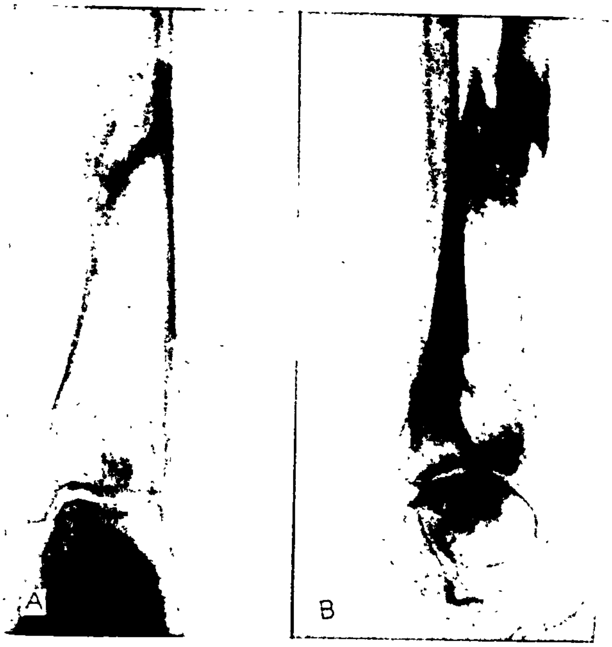


Fig. 2 *(Case 1)*.—Preoperative anteroposterior and lateral views of the left leg of J. W. B., showing obvious nonunion of a spiral fracture of the tibia, with sclerosis at the ends of the fractured bone. Note also the osteoporosis distal to the fracture.

mediate open reduction and fixation with a steel plate and screws. Postoperative treatment consisted of skeletal traction for four months, followed by an ischial weight-bearing long leg brace.

When the patient was first seen by us, about five months after the injury, the fracture had not united and the plate was markedly angulated (Fig. 4). On Sept. 12 operation was performed, consisting of removal of the plate and screws, curetting of the fracture site and intramedullary nailing. Pieces of alloplastic material were placed around the fracture site (Fig. 5*A*).

Gradual weight bearing with crutches was begun three weeks after the operation. Excellent callus formation was noted on the roentgen film within two months. This progressed to solid bony union and consolidation (Fig. 5*B*).

The nail was removed on June 16, 1954, no complications being observed.

Case 3.—L. B., a 15-year-old girl, was involved in a motor accident on Aug. 10, 1954, and sustained a compound fracture of the middle third of the right femur. Operation was performed elsewhere on Aug. 16 and consisted of open reduction and fixation with a steel plate and screws. Postoperatively a plaster cast hip spica was worn for two months. This was followed by three weeks of confinement to bed, exercises and then gradual ambulation on crutches, with no weight bearing on the right lower extremity. Consecutive roentgenograms revealed partial union on the medial side but a state of delayed union on the plated side of the fracture (Fig. 6*A*).

On Feb. 3, 1955, operation was performed. The metal plate and screws were removed, scar tissue was excised, and onlay grafts of alloplastic material were placed over the fracture. Six weeks of complete bed rest followed. Crutch walking was then resumed, with no weight bearing on the right lower extremity. For ten days a small amount of drainage (clear serous material) took place through the upper part of the wound. Follow-up roentgenograms showed presumptive callus formation within six weeks after the operation (Fig. 6*B*).

Case 4.—E. W., a woman aged 25, incurred a severe twisting injury to the right ankle on Aug. 22, 1953. At another hospital a plaster

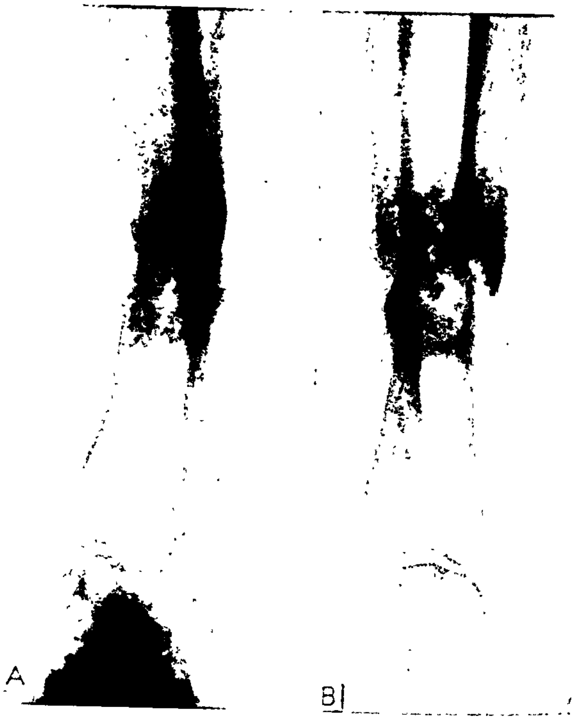


Fig. 3 *(Case 1)*.—*A*, postoperative anteroposterior view of the left leg of J. W. B. fourteen months after use of alloplast. There is apparent bony union across the tibial fracture. *B*, lateral view of the left leg, showing probable bridging of the gap with bone. Posteriorly and superiorly, where the alloplastic material was packed, the bone or callus is abundant.

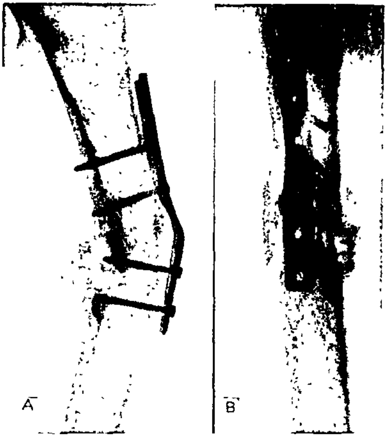


Fig. 4 *(Case 2)*.—Anteroposterior and lateral views of the left femur of L. J. S., showing delayed union and angulation of the plate five months after the injury.

cast boot was applied. Roentgenograms revealed a trimalleolar fracture with poor contact of the fracture of the tibial malleolus.

The plaster was removed on Oct. 12, and operation was performed ten days later. The medial malleolus was exposed, and fibrous tissue was curetted from the fracture site. Alloplastic material was then placed between the freshened bony surfaces, and internal fixation was obtained with a stainless steel screw. A plaster cast boot was applied and maintained in place for a total period of eight weeks, weight bearing being allowed during the last three. The patient was last seen on Jan. 6, 1954, before leaving the city. The operative wound was well healed, and roentgenograms revealed the fracture in good position. Ankle motion was good and weight bearing painless.

CASE 5. — C. M., a 35-year-old man, was thrown off a moving railroad car and sustained injuries to the lower part of the back on June 17, 1953. Roentgenograms revealed spondylolisthesis, with forward slipping of the fifth lumbar vertebral body on the sacrum. Pain in the back, and in the left leg persisted and became increasingly worse.

On Nov. 17 a laminectomy was performed, with complete removal of the fifth lumbar neural arch followed by an H graft of iliac bone. Pieces of alloplastic material were placed dorsally and on both sides of the graft. Postoperative care consisted of bed rest for

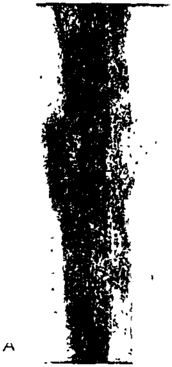


Fig. 5 *(Case 2)*.—*A*, lateral view taken on the day of operation, showing intramedullary nail and multiple pieces of alloplastic material anterior to fracture site. *B*, lateral view thirteen weeks after surgery showing large callus anteriorly at site of alloplastic graft.

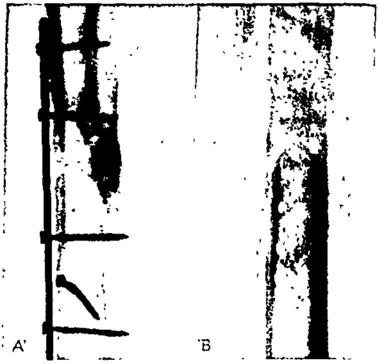


Fig. 6 *(Case 3)*.—*A*, anteroposterior view of the right femur of L. B., showing incomplete union six months after previous open reduction. *B*, lateral view showing presumptive callus posterior to fracture site six weeks after removal of plate and screws and the use of alloplastic graft.

three weeks, and followed by application of a corset for ambulation. One month after the operation there were no complaints of pain either in the back or in the lower extremities.

CASE 6.—H. B., a man aged 40, fell from a stepladder at home, on Mar. 7, 1954, with resultant pain, swelling, tenderness and deformity of the injured left forearm. Roentgenograms revealed comminuted fractures of the proximal shafts of the radius and ulna, the former without apposition. Closed reduction was attempted without success.

On Mar. 9, open reduction was performed. A Steinmann pin was driven down the ulnar shaft, and the radius was fixed with four screws and a steel plate. Alloplastic material was placed about the site of fracture of the radius. Seven weeks later the plaster cast was changed and the pin removed.

External fixation was maintained for fourteen weeks. No pain or tenderness was noted, and the operative wounds healed *per primam*. Clinically the bones of the forearm were united.

Follow-up care continued until Aug. 28, after which time the patient moved out of the city. Roentgenograms revealed the ulna to be well united, but the radius had not yet healed.

COMMENT

The alloplastic material has been innocuous in all the cases in which it has been used, thus far. In the first and third cases clear, oderless serous material drained through the operative wound. It ceased, however, within a short time. In both instances preoperative sterilization of the alloplastic material consisted of soaking in solution of formaldehyde for two hours, followed by repeated washings in saline solution. In the 4 other cases the period of sterilization was shortened to 10 minutes, and no apparent untoward tissue reaction occurred.

The established nonunion of the tibia was the result of the initial treatment, with incomplete and interrupted immobilization. Nevertheless, since the scar tissue was excised, alloplastic material placed around the freshened fracture site and a single steel screw inserted, union has taken place. The patient can now walk without crutches, whereas before the operation even partial weight bearing on the extremity was painful.

Delayed union in 2 cases occurred in the femoral shaft. In both instances it followed the use of plates and screws for internal fixation. In 1 case the poorly positioned plate bent; in the other the rigid plate actually appeared to hold the bone ends apart. In these cases alloplastic material, added locally about the fracture site, was used instead of a bone graft. Healing has progressed satisfactorily and probably was accelerated by use of the alloplastic material.

A fracture of the tibial malleolus of over three weeks' duration, with soft tissue interposition, can do better with some device, such as a bone peg, to stimulate union. Rather than add to the trauma by procuring a graft from the tibial shaft, we placed alloplastic material over and within the fracture site, and a steel screw was used to fix the malleolus to the shaft. This method was easier for both patient and surgeon.

In the cases of the lumbosacral graft and fresh fracture of the forearm the alloplastic material was not obviously harmful. Whether or not it stimulated healing we do not know.

SUMMARY

Alloplastic material composed of a mixture of formalized gelatin and mineral salts of bone was used in 6 clinical cases. The pathologic condition varied from established nonunion and delayed union of fresh trauma.

No infections or untoward sequelae resulted from the material in any of these cases. Local serous drainage followed prolonged soaking in solution of formaldehyde. This did not occur when the period of sterilization of the material was shortened

to ten minutes. Formaldehyde was used in the initial preparation of the alloplastic material as well as for its sterilization prior to surgical utilization.

The use of the alloplastic material appeared to stimulate the healing of bones in those conditions in which bone grafts are indicated.

ZUSAMMENFASSUNG

Ein aus einer Mischung von mit Formalin behandelter Gelatine und Mineralsalzen des Knochens bestehendes alloplastisches Material wurde in sechs klinischen Fällen benützt. Die Krankheitsveränderungen schwankten zwischen Versagen der Knochenheilung, verzögerter Heilung und frischer Verletzung.

In keinem der Fälle kam es zu Infektionen oder zu unerwünschten Folgeerscheinungen, die dem Material zugeschrieben werden könnten. Nach lange dauerndem Einweichen des Materials in Formalinlösung kam es zu lokalen Absonderungen seröser Flüssigkeit. Dies liess sich vermeiden, wenn die Sterilisierungszeit des Materials auf 10 Minuten verkürzt wurde. Formalin wurde sowohl bei der ursprünglichen Herstellung des alloplastischen Materials als auch zur Sterilisierung vor der chirurgischen Anwendung benützt.

Die Verwendung des alloplastischen Materials hat in Fällen, wo Knochentransplantationen angezeigt sind, offenbar zu einem Anreiz der Knochenheilung geführt.

RIASSUNTO

In 6 casi è stato usato un materiale alloplastico composto di una miscela di gelatina formolata e sali minerali di osso. Le indicazioni furono: i ritardi di consolidazione, le mancate consolidazioni e i traumi recenti.

In nessun caso si ebbero conseguenze spiacevoli nè infezioni del materiale impiegato. Vi fu soltanto un poco di secrezione locale sierosa in conseguenza del prolungato soggiorno in formaldeide, mentre questo non si vierificò quando il materiale era stato lasciato a sterilizzare per meno di 10 minuti. La formaldeide venne impiegata tanto nella preparazione del materiale alloplastico quanto nella sua sterilizzazione prima dell'impego chirurgico.

Sembra che l'uso di questo materiale stimoli la guarigione delle fratture in tutti quei casi in cui è indicato il trapianto osseo.

RÉSUMÉ

Du materiel alloplastique, composé d'un melange de gélatine formalisée et des sels minéraux des os fut appliqué en 6 cas cliniques. Les conditions pathologiques variaient de non unification établie et unification retardée après un traumatisme récent.

Ni des infections ni suites facheuses résultèrent du matériel dans aucun de ces cas. S'il était immergé trop longtemps dans la solution de foermaldéhyde, du drainage local, séreux en résulta. Cela ne fut plus observé, quand la période de stérilisation fut accourcie à 10 minutes. On se servait de formaldéhyde pour la préparation initiale du matériel alloplastique, ainsi que pour la stérilisation avant l'usage chirurgical. L'usage du matériel alloplastique paraissait de stimuler l'unification des os dans les conditions, ou des greffons osseux sont indiqués.

SUMÁRIO

Material aloplastico, composto de uma mistura de gelatina formalizada e sais minerias de osso foi usado em 6 casos clinidos de afecções varias, desde não união já definida, e união retardada ao trauma recente.

O uso deste material não provovou, em caso algum, infecções ou sequelas desagradaveis. Após colocação do material po-

tempo prolongado em solução de formaldeido ocurreu drenagem serosa local. Tal não sucedeu quando o periodo se esterilização do material foi reduzido para dez minutos. A solução de formaldeido foi usado no preparo inicial do material aloplastico, bem como em sua esterilização antes de seu emprego cirurgico.

O emprego do material aloplastico parece terestimulado a cicatrização dos ossos naquelas afecções em que são indicados os encertos osseos.

REFERENCE

Lichtor, A.: Alloplastic Bone Graft Used Experimentally, J. Internat. Coll. Surgeons 22:238-242, 1954.

◆

In a farmhouse near Rochester there happened to live a woman with an enormous abdominal swelling which must have weighed an incredible number of pounds. Such masses of tissue grew from a diseased ovary, and by their very bulk and weight often become inconvenient and even dangerous. Daring operations were beginning to venture to remove them. A village doctor named Ephraim MacDowell in Danville, Kentucky, had been the first to perform such a feat successfully.

Dr. William Worrall Mayo arranged to meet a few of his fellow practitioners at the farmhouse one Sunday morning, and he proposed to tackle this unfortunate woman's truly prodigious growth. According to custom no fewer than fifteen other doctors from the neighbourhood had gathered to watch the performance in the farmer's parlour.

Unfortunately, the train bringing Dr. Mayo was delayed, and it was not until some hours later that, full of impatience to get busy with the operation, and with apologies to his medical colleagues for keeping them, he reached the farmhouse. There on the doorstep was his elder son William, who shyly informed his father that he had thought it best to get on with the job, with the help of his brother Charles: that in fact he had removed the tumour and there it was in the family washtub, and the patient was safely in bed, with a calm pulse.

—*Williams*

Plastic and Reconstructive Surgery

The Study and Preparation of Plastics

Laboratory Research and Clinical Application

MILTON C. COBEY, M.D., F.A.C.S.*
WASHINGTON, D. C.

THE term "plastic" is newer than the substance it represents. Bakelite, first used commercially for radio sets and the like, dates backward some forty years. It was used in a bakelite plastic hip mold by Dr. Smith-Petersen in 1926. Unfortunately, it had to be discarded because of the annoyance of the noise it made on walking. The application of the plastic hip mold may be one of the earliest surgical uses of plastic inside the human body. The acrylic plastic mold for replacement arthroplasty of the hip has been used since by many. The Judet acrylic prosthesis for the hip is at least ten years old. Membranes of plastic material interposed between joint surfaces in the knee and elbow have been used. Dr. John Kuhn first used cellophane in the knee joint as a replacement of fascia for arthroplasty of that joint as early as 1938.

Acrylic plastics have been used externally for arm and leg splints, it being possible to alter their shape to conform more or less to the body by simply heating the plastic with hot water. The lucite plastic cock-up splints and Colles' forearm fracture splints have been popular. Lucite finger splints and extremity molds have been available commercially for some time.

It was discovered in the middle thirties that lucite, which is a form of sodium polyacrylate, would transmit light through its long axis. It would carry light around curves in its own configuration. As early as 1940 retractors were made from lucite to be used in the mouth, knee joint and other sites.

Plastics have also been used for other purposes. The self-locking nylon washer is employed in nuts for the Wilson spinal fusion bolts, or for the nut on the McLaughlin trochanteric nail. These have been used inside the body successfully, causing reactions only infrequently. There is a sensitivity factor in the use of nylon, but it is infrequent.

Ivalon sponge is a plastic material that has been used inside the body by both reconstructive surgeons and general surgeons. Its implantation in the breast tissue to alter the configuration of the breast is well known. It has also been used successfully in corrective operations on the face and on the ear. It has met with some disfavor, for after the water is absorbed from it the mass is rough and hard. If the breast tissue is drawn too tight over it in

---

*Professor of Orthopedic Surgery, Georgetown University Medical School.

Submitted for publication Sept. 19, 1955.

the build-up operation, there may be a slough. Ivalon sponge has been tried on dogs and found to be nonirritant. This study of its use in the joint was tried on some 36 dog joints in an effort to find out, first, that the joint would tolerate it, and second, that it would remain soft owing to the action of the synovial fluid. When placed in tissues other than a joint, the material of the ivalon sponge becomes very hard. Water from the sponge, which will necessarily keep it soft for surgical application, is rapidly absorbed. When placed in a joint, however, it remains soft because of the synovial fluid and does not become hard or firm.

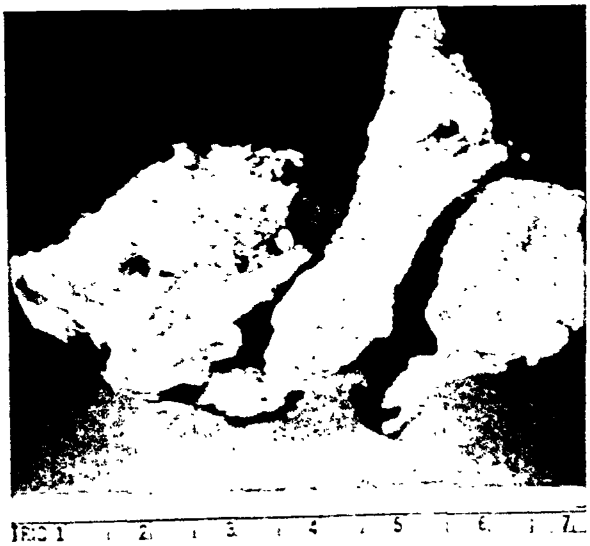


Fig. 1.—Ivalon sponge in gross section of human knee joint.

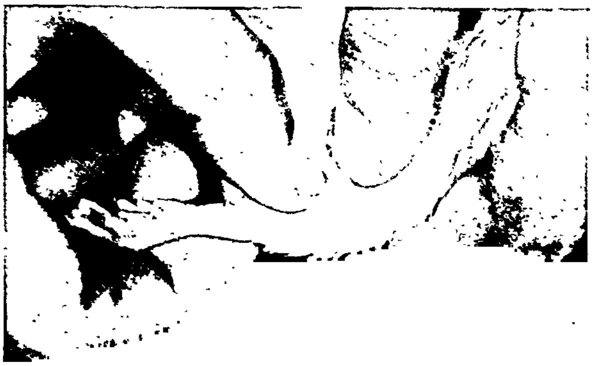


Fig. 2.—Identification of fracture site.

Fig. 3.—Injection made into site of fracture.

When the cartilage is removed from one or both opposing surfaces of the joint, fibroblasts will grow into it, rapidly fixing it into place so that it will not slip. When used as an interposing membrane in a oint, it is held in place by rapid growth of brous tissue. The fibrous tissue fixes it sufficiently between the bone ends to obviate the need of sutures. Large cells (macrophages) appear in the interstices of the sponge. These macrophages seem to transpose themselves into chondroblasts, osteoblasts and osteoclasts. If this occurred in tissues other than a joint, where the sponge is bathed by synovial fluid, and early motion were not permitted, bone would be produced. It has been shown that after ivalon sponge has become dry and hard in fractures other than joints, where there is no motion, the same growth of the early chondral and osseous cells will produce bone. *It does not here.* When the sponge is soft and motion is continued the interposition of fibrous tissue is the prominent feature. The ivalon sponge, therefore, acts as an excellent interposing membrane between the joints, permitting free and satisfactory motion. This applies particularly to joints that would become ankylosed or have been ankylosed and are separated to produce mobile joints. The knee joint tolerates a large mass of sponge, cut at the operating table to fit the condyles of the joint, which lie beneath the patella, pre-

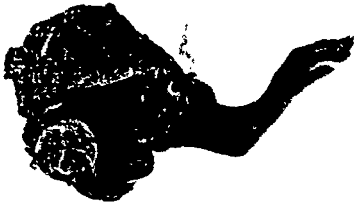


Fig. 4.—Gross appearance of fracture site after injection.

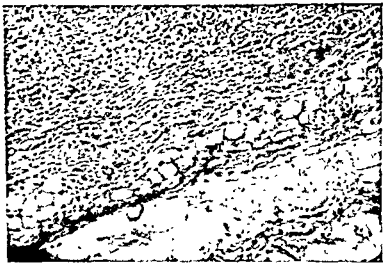


Fig. 5.—Microscopic appearance after injection.

venting adherence to these tissues again. This has been done in man as well as in the dog. It was used successfully in hypertrophic arthritic as well as in rheumatoid arthritic joints. No malignant change was observed in any of the dog joints, or in a study of the human joints.

The preformed plastics that have been employed up to this time include bakelite, mylar, fluorothene, nylon, acrylic and several others that can be shaped by heat to make an appliance that will fit over the end of a bone. A plastic material was needed that would "set" without producing heat in polymerization that would burn the tissues. These materials had to be set by cold polymerization; that is, they must not produce heat on polymerizing that would overheat and destroy tissue. Cellulose acetate, the earliest of these and first produced in 1936, could be painted as a covering over plaster of paris casts. Nylon was later described as a strong protective covering. So long as these materials did not crack, the cast would not absorb moisture and remained strong and firm throughout the period of its use. In order that these casts might be so covered they had to be "bivalved" and painted both inside and out.

The development of a new type of plastic known as the melamine resins opens another new field in plastic research. They have a powerful gluing action when mixed with some type of catalyst. The mixing of this material with plaster of paris particles produced a strong bandage. After it had been soaked in water and allowed to set, strong casts could be made—four times stronger than normal plaster—and then would not absorb water or become softened in it. The setting time, either fast or slow, could be controlled and its use as a cast caused no more irritation to the patient than did ordinary plaster. Since there is practically no waste from soaking this plastic in water, there is no damage to basins and buckets. As applied to the patient, it requires one-fourth the number of rolls needed as with the usual hard-setting type of plaster. A successful roll bandage type of plastic for casts was made.

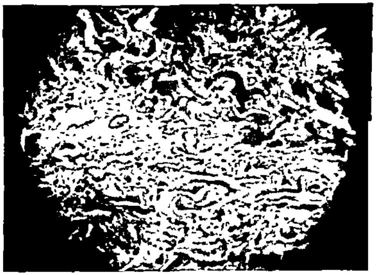


Fig. 6.—Microscopic appearance of foreign body response to plastic.

Efforts are being made in our laboratory at present to work out an internal splint, since we have now perfected an external splint of a cold polymerizing agent. A nontoxic, nonirritant plastic must be created that will form a sufficiently hard mass to adhere to bone ends and hold them together. The plastic must polymerize in the body and produce no heat in so doing. Many compounds have been devised by us and our chemists. The first compound was an already known substance, elvanol, suggested in this work by the British. When elvanol is changed into an acetate emulsion, a fairly firm hard mass is formed that would adhere to the bone ends. This emulsion was injected into the fracture site. It was not found strong enough, however, so it was mixed with a bone salt slurry of calcium carbonate, magnesium oxide, stronsium carbonate, phosphoric acid and citric acid and then buffered to a normal pH solution. The resulting material proved to be much firmer, but still not firm enough to hold the bone ends in good approximation without the necessity of external fixation. The acrylic compounds could not be used, because of their intense heat on polymerizing. Substances such as polyvinyl ethyl methacrylate maleic anhydride with polyvinyl alcohol were tried with dextran and with glycerin. At first, glycol diacetyl thylate in olive oil was thought by some to be good, but it proved decidedly toxic.

It is impossible to list all the compounds that have been tried, but those most successfully used were the cellulose compounds. I observed that Irish moss could be used internally, polymerized with catalysts calcium lactate and calcium phosphate.

By using a two-injection technic, i. e., the sterile cellulose compound in one syringe and the catalytic salt agents, sterilized and buffered, in the other, material could be injected at the fracture site. Otherwise the materials would set solidly in the syringes and injection would be impossible. It was noted that this material would be completely absorbed in four to six months; that it seemed to remain firm for four weeks or longer; that it was nonirritant and nontoxic, and that it had *some* gluing properties. Up to now, this has been my most successful compound.

A lack of sufficient strength of the cellulose mass suggested the protein collagen compounds as they occur in the bodies of animals. By extracting beef collagen in 0.01 per cent acetic acid, pure gelatin could be obtained. This, mixed with one of the salt compounds to be used as a catalyst, produced a nonirritant mass. Although it was not as solid as the cellulose mass, it seemed to have greater power of adhering to the osseous surfaces. Unfortunately, it was hydroscopic and was absorbed in three to seven days. Pure gelatin and beef collagen were tried together, and the same results were obtained. This led to the next step, which is now under development; i. e., the use of gelatin with cellulose compounds and the salts as catalytic agents. In time, with enough experimentation and enough alterations in these compounds, this may prove satisfactory. Research on this has not progressed far enough to justify any final statement. There is hope and just a bit, perhaps, of wishful thinking.

SUMMARY

This paper is a review of the development and use of certain plastic materials during the past forty years. This research work, begun by the author twenty years ago, has in some measure helped to advance the study, development and use of the various plastics. The number of plastics available to the thinking chemist is almost unlimited. The possibilities of plastics for use in orthopedic surgery are also unlimited, and the future of their use in

surgery in general appears likely to become an important development in medicine.

ZUSAMMENFASSUNG

Die Arbeit gibt einen Überblick über die Entwicklung und Verwendung gewisser Kunststoffe während der letzten 40 Jahre. Die vom Verfasser vor 20 Jahren begonnene Forschungsarbeit hat in gewissem Masse zum Fortschritt der Untersuchungen, der Entwicklung und der Anwendung verschiedener Kunststoffe beigetragen. Die Zahl der erhältlichen Kunststoffe ist in den Augen des Chemikers fast unbegrenzt. Die Möglichkeiten der Verwendung von Kunststoffen in der orthopädischen Chirurgie sind unendlich, und ihre Anwendung in der allgemeinen Chirurgie scheint zu den wirklichen Fortschritten in der zukünftigen Medizin zu gehören.

RÉSUMÉ

Ce travail est une revue du dévéloppement et de l'usage de certains materiaux plastiques pendant les derniers quarante ans. L'auteur qui a commencé ces recherches avant quarante ans, aide à un certain degré à avancer l'étude, le dévéloppement et l'usage de différents matériaux plastiques. Le nombre des plastiques à disposition du chimiste est presque sans limit. Les possibilités de l'usage des plastiques dan la chirurgie orthopédique est presque sans limit et le futur de l'usage des plastiques en chirurgie générale parait être un vrai dévéloppement futur en médecine.

SUMÁRIO

Este artigo constitui uma revisão do desenvolvimento e uso de certos materiais plasticos nos ultimos quarenta anos. Este trabalho de pesquiza, iniciado pelo autor há vinte anos, auxiliou de alguma forma o progresso do estudo, desenvolvimento e uso de varios plasticos. O numero de plasticos disponiveis ao quimico é praticamente ilimitado, as possibilidades dos plasticos para uso na cirurgia ortopedica são tambem ilimitadas e o futurodo uso dos plasticos na cirurgia geral parece ser um futuros acontecimentos reais da medicina.

RIASSUNTO

Vengono esposti ed elencati i materiali plastici usati in chirurgia negi ultimi 40 anni. Il lavoro di ricerca è stato iniziato 20 anni or sono ed ha giovato allo studio, allo sviluppo e al progresso di tali sostanze. Il numero di esse è praticamente illimitato, come pure illimitate sono le possibilità di impiego in chirurgia ortopedica, mentre in chirurgia generale l'uso dello sostanze plastiche diventerà, nel futuro, una fonte di indiscutibile progresso.

BIBLIOGRAPHY

Cobey, M. C.: Rest and Protection Treatment of Anterior Poliomyelitis, J.A.M.A. 109:1120-1121, 1937. Self-Illuminating Patella Retractor, J. Bone & Joint Surg. 22:1103, 1940. Plastic Immobilization—A New Method, Am. Surgeon 20:6, 1954. Plastic Immobilization of Fractures, Geriatrics 9: 4, 1954.

Ingraham, L. D., and Alexander: Synthetic Plastic Materials in Surgery, New England J. Med. 236:362, 1947.

Kuhns, J. A.: Nylon Membrane Arthroplasty of Knee in Chronic Arthritis, J. Bone & Joint Surg. 35-A:929-936, 1953. Nylon Arthroplasty of Knee, Surg., Gynec. & Obst. 91:351-362, 1950.

Kuhns, J. A., and Potter, T. H.: Nylon Arthroplasty in Rheumatoid Arthritis, Surg., Gynec. & Obst. 91:351-362, 1950.

Popovici A.: Polyvinyl Plastic Sponge in Experimental Orthopedic Surgery, 7:2, 1954.

Principles of Plastic Surgery in Industry

CLAIRE L. STRAITH, M.D., D.D.S., F.A.C.S., F.I.C.S., D.A.B.

DETROIT, MICHIGAN

INDUSTRIAL injuries undoubtedly would profit by application of the principles of plastic surgery in the course of their treatment. Those treating injuries from the scalp to the toes can utilize plastic principles to great advantage in securing improved function, less disability and more pleasing cosmetic results than can be obtained otherwise.

Scalp injuries occasionally occur from falling objects or flying pieces of metal in industrial plants. These scalp lesions usually heal with ordinary treatment. Occasionally a portion of the scalp is actually severed, leaving exposed skull, which does not permit a direct skin graft on the bone. Such wounds should be treated immediately by the transfer of a flap from a surrounding area to cover the denuded bone of the skull (Fig. 1). The necessary skin graft can then be applied to the donor site on the galea, and the area covered with a tied-on dressing. This is easily applied by leaving the skin graft sutures long and tying them over a gauze pad of sufficient size to produce the necessary pressure.

The skin-grafted area can then usually be covered by the hairdress, but if it is conspicuous it is sometimes possible, by multiple excisions, to advance the surrounding scalp in successive stages and eliminate the conspicuous area.

The use of hair nets for women working near machines should be mandatory, but frequently none are used, and portions of the scalp, or, in fact, the entire scalp, may be avulsed after entanglement of the hair in the machinery.

When a scalp is avulsed, the hair should be removed and preserved. In my opinion it would be a good principle in all cases to split the scalp down to the base of the hair follicles and use this outer layer (almost a full-thickness graft) immediately as a hair-bearing skin graft.

It has been proved on many occasions that replacement of the avulsed scalp is futile, because the entire scalp becomes necrotic.

Any or all portions of the scalp that still remain uncovered can be allowed to granulate, and split-thickness grafts can be applied later over the entire area. Grafts applied over a convex surface, such as the crown of the head, need practically no pressure if sutured on with some tension. This done, paraffin mesh gauze can be stretched over the scalp and sutured around the lateral margins to hold the grafts down in firm position. Over this, simple moist dressings can be applied, and usually the graft will take without cumbersome pressure dressings applied over the entire head.

The patient's own hair can be sent out for the preparation of a wig. In addition to this, another wig should be purchased, because they require cleaning as often as the normal scalp needs shampooing. Under normal use and care, a wig will have to be replaced approximately every eighteen months.

Injuries to the facial bone are fairly common industrial accidents. One of the most frequent injuries is crushing of the malar bone. Swelling follows rapidly, and malar bone (Fig. 2). Swelling follows

---

Read at the Twentieth Annual Congress of the United States and Canadian Sections, International College of Surgeons, Philadelphia, Sept. 12-15, 1955.

From the Straith Clinic for Plastic, Reconstructive and Hand Surgery, Detroit.

Submitted for publication Nov. 4, 1955.

rapidly, and the diagnosis of this type of depressed fracture should be made at the earliest possible moment and reduction carried out to reduce deformities to a minimum. I usually elevate such malar depressions with the region under pentothal or thorough infiltrative anesthesia around all the smaller bone attachments. By passing an elevator beneath the malar bone, through a ¼ inch (0.6 cm.) incision above the second molar tooth, and lifting upward, most malar bones can be elevated into good position. Pressure from the outside toward the nasal bones will impact the fracture at the infraorbital foramens and maintain the bone in position without further complications. If there is much comminution, it is a good principle to make an incision at the outer angle of the orbit. A drill hole is then made in the corner of the frontal bone and the malar bone, through which the malar bone is wired up into position as soon as possible after the accident.

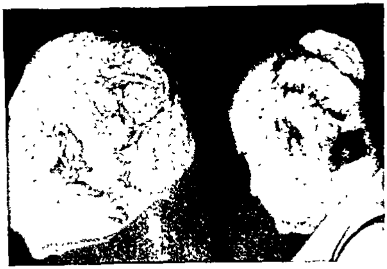


Fig. 1.—Wound caused by flying metal, which severed portion of the scalp and lacerated the ear. Exposed bone demanded immediate coverage with scalp flap from occiput. A split thickness graft was applied on the gala at the donor site and tied on with sutures left long at the wound edges. The edge of the ear was replaced and sutured.

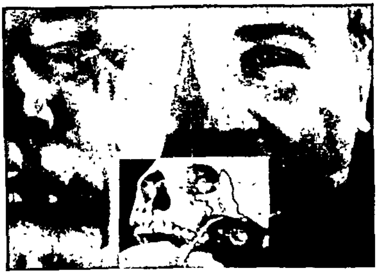


Fig. 2.—Malar bone fracture. This should be diagnosed early and elevation attempted at once. Pentothal or local anesthetic is used, and a curved elevator is introduced intraorally through a small incision over the second molar tooth. The bone should be lifted upward and forced inward by thumb pressure over the malar bone to cause impaction in the infraorbital region.

Transverse fractures of the maxilla are encountered in some cases. If the infraorbital rim is intact, good suspension can be secured by passing a stainless steel wire through a small drill hole in the infraorbital rim down under the lip and attaching it to wires fastened around the upper teeth or an arch bar. The jaw can then be suspended in the proper position, and external appliances can be avoided (Adams method).

Severe comminuted fractures involving the entire face may require external appliances of various forms to maintain the position of the numerous fragments. Frequently open reduction may be required for satisfactory results.

Crushing injuries of the nose sometimes result in decided deformities in spite of all efforts toward elevation.

The amount of the depression in such a case can be determined by measuring the distance from the dorsal skin of the nose to the base of the metal of a profilometer. The length of the necessary transplant can also be determined in this way, and a proper piece of preserved cartilage or ilium can be fashioned to fill the defect. The transplant is inserted through a midcolumellar incision into a tunnel formed beneath the nasal skin.

The nose or some other portion of the face occasionally may be severed by an exploding emery wheel or other industrial

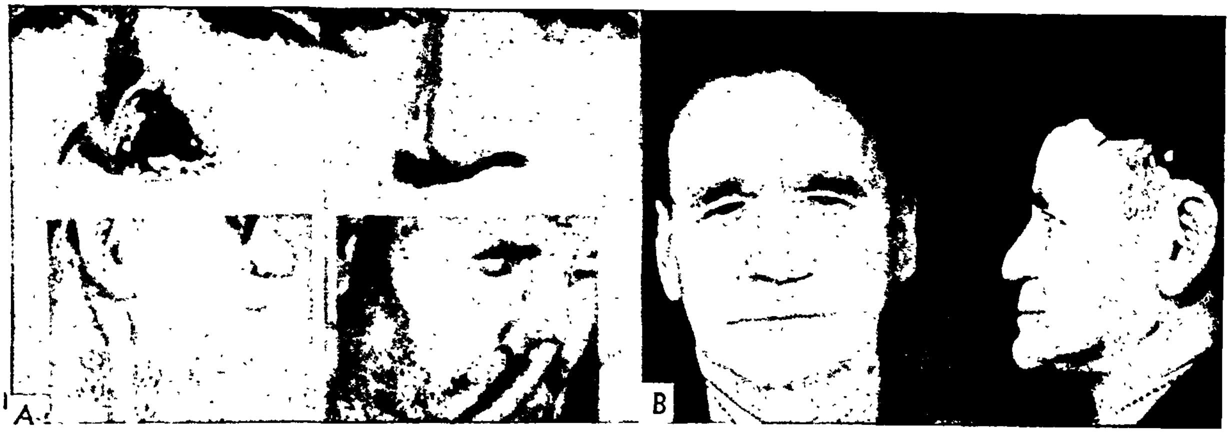


Fig. 3.—*A*, tip of the nose severed by an exploding emery wheel, repaired with a tube pedicle picking up hairless matching skin from behind the ear. *B*, photographs taken nine years later, showing well matching graft and inconspicuous neck scar.

missile. The nasal tip may be restored by one of several methods. In treating men I try to avoid forehead scars and in most cases use a tube pedicle graft taken from the sternocleidomastoid muscle area. Skin from behind the ear is used for the reconstruction of the nasal tip. This produces a nasal tip with excellent matching and hairless skin and prevents the forehead scar (Fig. 3). In women a forehead pedicle can be used satisfactorily. The resultant skin-grafted area on the forehead may be covered by the coiffure.

Burns from industrial explosions frequently involve the eyes and eyelids. In cases of severe ectropion the cornea is greatly endangered by constant exposure (Fig. 4). An early effort should be made to correct the ectropion by skin grafts applied to the lids. If the area is small, an excellent graft can be obtained from the upper eyelid, larger masses of skin of good matching quality can be obtained from the postauricular region.

When the eye and the eyesocket have been destroyed by acid or other agents, a new eyesocket should be constructed. The skin of the upper and lower lids is undermined to the orbital rims. A skin graft is sutured to the edge of the denuded underside of the upper lid and packed into the eyesocket, then back around to the edge of the denuded lower lid. Pressure can be maintained on this graft by inserting a simple petrolatum gauze packing or a mold of modeling compound. This pack is left in place from six to eight days, after which a prosthetic appliance should be employed to maintain the size of the orbit and avoid shrinkage of the skin graft. Later an artificial eye can be made to correspond with the normal eye.

In some cases the eyelashes may also be destroyed. These are replaced by making a horizontal incision in the edge of the lid and inserting a thin line of hair-bearing skin. Its position is maintained by through-and-through mattress sutures.

Fig. 4.—*A*, severe cheek and lid burns causing ectropion. These should be skin grafted early, to avoid corneal ulceration. *B*, photograph taken twelve years after the operation.

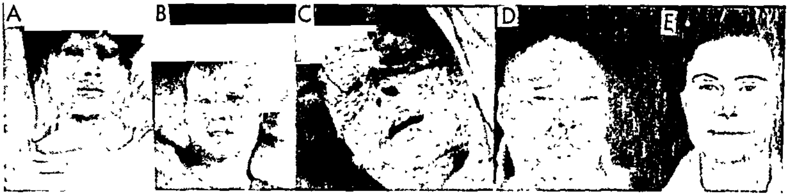


Fig. 5.—*A* and *B*, magnesium burns incurred in industrial plant. The burned areas included the entire face, as well as the ears, the neck and the thighs. *C*, sheet of skin graft applied to forehead, eyelids and nose and another over side of neck and under chin. Both were applied at the first operation. *D*, tube pedicles brought up for reconstruction of ears. Additional grafts were placed over both lips and cheeks, and eyebrow grafts were applied on each side. *E*, result two years later.

The addition of the eyelashes adds much to the restoration of normal facial expression.

Eyebrows are frequently destroyed and can be replaced fairly satisfactorily by the insertion of narrow hair-bearing grafts from the mastoid region or the back of the neck.

Other burned areas should be denuded of necrotic skin as soon as possible and grafting begun at once. Split-thickness grafts over the bony areas of the face (Fig. 5*A*) usually will "take" more readily than will those over the movable parts of the face. Furthermore, grafts over bony areas such as the forehead (Fig. 5, *C* and *D*) remain smooth, while those placed over muscular areas, such as the front of the neck, often take on a washboard aspect and contract to less than half their original size, in spite of all efforts to prevent it.

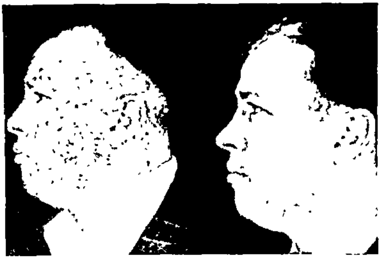


Fig. 6.—Pigmented facial areas often caused by mine, chemical or other explosions, as well as by street accidents. These can usually be removed by one or more sanding operations.

In coal mine and industrial explosions, pigment is frequently blown into the facial skin. An immediate attempt to remove this pigment, with anesthesia, if necessary, should be made by scrubbing the area with a stiff brush (Fig. 6).

Occasionally particles of pigments still remain embedded in the skin. Later these areas can be thoroughly sandpapered with a rapid revolving sandpaper cylinder, removing practically all the pigmented areas from the face (Fig. 7).

In cases of chemical or explosive burns, the ears are sometimes partially or completely destroyed. They can be partially reconstructed with pedicle flaps brought up from the neck or arms. In some instances, entirely new ears must be constructed (Fig. 5*C*). Any portion of a severed ear that can be recovered should be sent to the hospital with the patient, because the cartilage matrix in this part is by far the best supporting structure upon which to construct the new ear. The skin is removed from this cartilage; then, through the open wound at the site of the injury, a space behind the ear can be undermined and the ear cartilage buried under the skin. The wound is then closed in the usual manner. At a later date, skin grafts wrapped over a mold of modeling compound are inserted beneath this grafted bit of cartilage, between it and the scalp. Three weeks later the mold is removed, and the auricular appendage is thus separated from the head. A tube pedicle can be brought up from the side of the neck and attached to the curve around the edge of the auricle to form a new helix.

Axillary burns are fairly common and produce restricting bands of skin and scar tissue between the arm and the chest. If there is available tissue under the axilla, down the side of the body, multiple Z plasties can be done; if this is not possible, a large Z plastic flap transferring masses of good skin up into each axilla may be used. This will eliminate the scar tissue bands and produce a more normal range of motion of the extremity.

Occasionally shirt sleeves or other portions of clothing become tangled in machines, avulsing portions of the skin of the upper part of the arm. If such skin masses are not too badly macerated, they can be defatted and used as free grafts, but it is probably better to discard them and immediately replace this denuded skin with split-thickness grafts held on by proper pressure dressings.

The hands, of course, are probably more frequently injured in industrial life than any other portion of the body. Roller injuries and burns cause avulsions or loss of skin from one or both sides of the hand (Fig. 8). These injuries can be covered by thick split grafts (Fig. 9) provided the tendons are not exposed.

The primary repair of severed tendons and nerves is indicated if there is sufficient overlying soft tissue to cover the defect. If, however, the tendon is involved, abdominal pedicles should be prepared to cover this defect. Tendon grafts can be inserted at a later date to restore normal function (Fig. 9*B*). One disadvantage of abdominal pedicles, however, is the fact that they are usually considerably thicker than the normal hand skin and a fatty mass developing in the palm or even over the back of the hand is sometimes objectionable (Fig. 9*C*). This can be reduced in size by repeated excisions from one side and then the other in a defatting process.

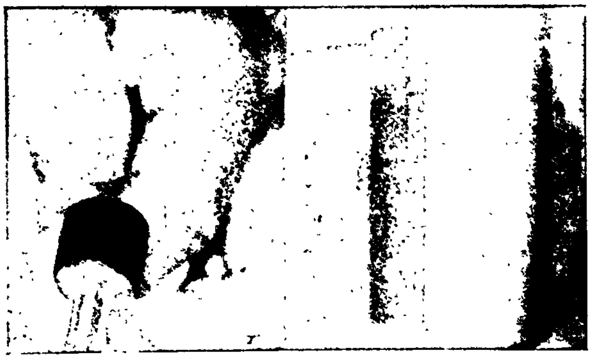


Fig. 7.—Instruments used to remove pigment, acne, pockmarks, etc. *Left*, rapidly revolving ½-inch (1.27 cm.) cylinder; *right*, 2 inch by 1 inch (5.08 by 2.5 cm.) cylinder.

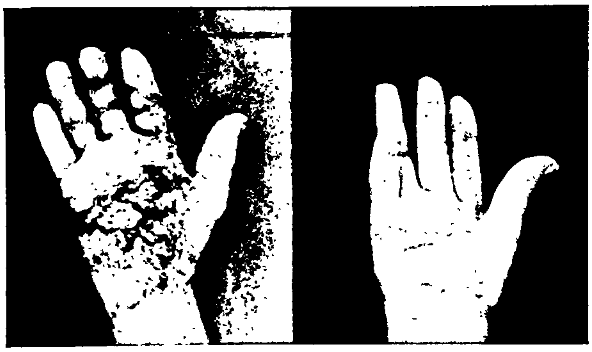


Fig. 8.—Roller injury. The palmer skin was avulsed, but, since the tendons could be covered, a thick split skin graft was applied within twenty-four hours.

If the entire avulsed skin of the hand, together with the underlying fat that usually accompanies such an avulsion, is replaced as a graft, it will almost always result in total failure. It might, however, be worth while to use the avulsed skin, if not too badly damaged, as a covering. The entire skin, when used, should be thinned to a thick split graft thickness and then applied over the denuded area.

Temporary coverage by split thickness skin graft dressings can be used. The

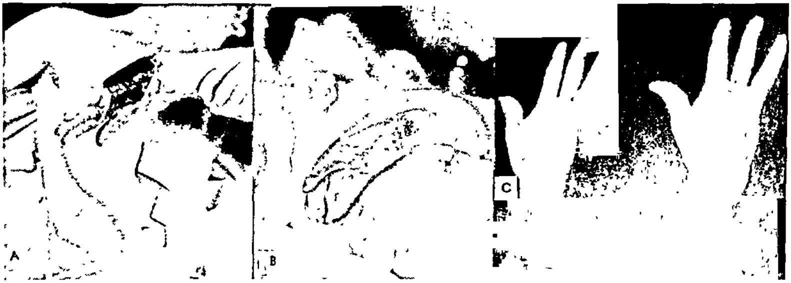


Fig. 9.—Avulsion of skin from both sides of the hand. These areas were covered at once with split skin grafts. *A*, left hand showing avulsion of skin on both sides. Pedicle flaps outlined on patient's right side. *B*, pedicle flap elevated and wrapped around hand. A skin graft was applied to the donor site. *C*, photographs taken twenty years later, showing slight excess of fat in pedicle. The hand has always been functional, however, and no further surgical intervention, such as a procedure to remove the excess fat, was desired.

hands, however, probably should eventually be covered with pedicle grafts, because the thin graft over the exposed bone ends often breaks down, leading to repeated ulcerations and total incapacity of the hand.

Tendon damage, fixation or tendon losses should be repaired, reasonably soon after a proper skin covering has been obtained, by using the palmaris longus or the long extensor tendons of the toes as tendon grafts. It is important that the tendon sheaths be excised to prevent adherence, and the tendon pulleys be conserved or constructed, so that a functional hand can be produced at the earliest possible time. Nerve sutures or nerve grafts should also be attempted at the same time the tendons are repaired.

Injuries to the lower part of the leg, especially over bony areas such as the anterior tibial border, ankle and heel, are frequently the result of heavy falling ob-

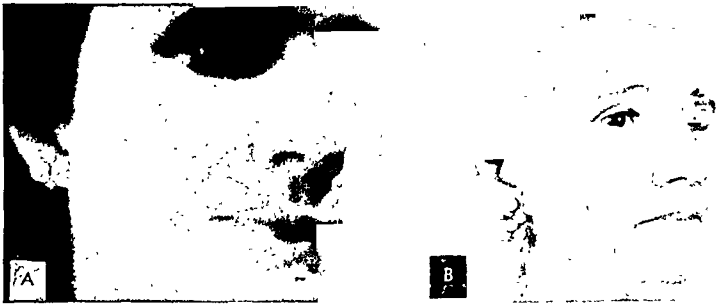


Fig. 10.—*A*, facial wound. Heavy needles and sutures should be avoided especially in facial wounds, because conspicuous scars may ruin the patient's social or business prospects. The scar was excised and resutured with subcuticular stitches but the wide ends of the stitch marks are still visible (*B*). This could have been avoided by the use of finer materials and subcuticular stitches at the original operation.

jects, old fractures etc. Although it is time consuming, it is probable that cross leg pedicles, which can be used to cover such areas with a thick mass of normal skin and fat pad, will be better in the long run than many attempts at split grafts, which frequently break down and cause subsequent disabilities.

Ankle defects can be covered by cross leg pedicles from above the knee or the calf of the leg. Heel injuries can be covered with pedicles from these same areas. In older individuals, one must consider carefully the arterial supply and use the means that will be least likely to cause a possible thrombosis, or embolism. Positioning is also important to preserve joint function. In most younger workers, cross leg pedicles should be the method of choice.

To minimize subsequent stitch marking nd conspicuous scarring, it is our feeling t in plastic procedures, especially about e face (Fig. 10*A*), the use of heavy needles and suture material, skin clips, etc., should be avoided. Fine needles and fine suture materials should be used and every effort made to leave as inconspicuous a scar as possible. Subcuticular sutures, in our experience, best assure this purpose (Fig. 10*B*).

In the more serious injuries described above, of course, it is essential that normal function be restored at the earliest possible moment to minimize the disability incurred. It is my impression that the principles of plastic surgery applied to these injuries, will accomplish both an improved function, lessened disability and a more pleasing cosmetic result.

ZUSAMMENFASSUNG

Der Verfasser empfiehlt eine umfangreichere Anwendung plastischer Verfahren in der Behandlung von Gewerbeverletzungen einschliesslich der Zerreissungen der Kopfhaut, der Gesichtsknochenverletzungen, der Querbrüche des Oberkiefers, schwerer Splitterbrüche des gesamten Gesichts, Quetschverletzungen der Nase, schwerer Verbrennungen, Ablagerungen von Bergwerkspigmenten in der Gesichtshaut, Sehnen- und Nervenzerreissungen der Hand und Verletzungen der Unterschenkel und der Fussgelenke. Er weist darauf hin, dass die Grundsätze, auf denen die plastische Chirurgie aufgebaut ist, sich in hohem Masse auf dem Gebiete der gewerblichen Schädigungen anwenden lassen und zu einer Verbesserung der Funktion, zur Herabsetzung der Arbeitsunfähigkeit und zu befriedigenderen kosmetischen Resultaten als andere Behandlungsmethoden führen können.

RIASSUNTO

L'autore raccomanda un più largo impiego di metodi plastici nella cura dei traumi professionali, como lo scuoiamento, le fratture delle ossa facciali, le fratture della mandibola, le fratture comminute gravi della faccia, le lesioni da schiacciamento del naso, le ustioni, gravi, i tatuaggi della cute del volto da pigmenti minerari, la sezione di tendini o nervi della mano, le lesioni delle gambe e dell'anca. Viene sottolineato il fatto che i postulati della chirurgia plastica trovano la loro applicazione più completa nel campo industriale e raggiungono un miglioramento funzionale, una diminuzione dei deficit, un perfezionamento dei risultati estetici.

RÉSUMÉ

L'auteur préconise une application plus fréquente des techniques de la chirurgie plastique pour le traitement des lésions industrielles telle que l'avulsion du cuir chevelu de la tête, le traumatisme de l'os facial, les fractures transverses de l'os maxillaire, les fractures comminutives sévères des os du visage, les lésions écrasantes du nez, brûlures sévères, implantation de fragments de substances pigmentaires dans la peau du visage, les tendons

ou nerfs coupés de la main, ainsi que les blessures de la jambe et de la région tibio-tarsienne.

Il montre que les principes, sur lesquels la chirurgie plastique ets basée, peuvent être appliqués à la chirurgie industrielle et qu'ils peuvent améliorer la fonction, diminuer, l'incapacité et obtenir de meilleurs résultats cosmetiques qu'avec des methodes ordinaires.

SUMÁRIO

O autor recomenda o uso mais liberal de metodos plasticos no tratamento das lesões de origem industrial, incluindo avulsão do couro cabeludo, trauma dosossos faciais, fraturas transversais dos maxilares, fraturas cominutivas graves de toda a face, lesão por esmagamento do nariz, queimaduras graves, depositos de pigmentos na pele da face, secção de tendões ou nervos na mão, e lesões das pernas e tornozelos. É salientado que os principios em que se baseia a cirurgia plastica são aplicaveis no campo industiral, podendo promovera melhoria da funÉão, diminuir a incapacidade e obter melhores resultados cometicos do que de outra maneira.

> Brief and powerless is Man's life; on him and all his race the slow, sure doom falls pitiless and dark. Blind to good and evil, reckless of destruction, omnipotent matter rolls on its relentless way; for Man, condemned today to lose his dearest, tomorrow himself to pass through the gate of darkness, it remains only to cherish, ere yet the blow falls, the lofty thoughts that ennoble his little day; disdaining the coward terrors of the slave of Fate, to worship at the shrine that his own hands have built; undismayed by the empire of chance, to preserve a mind free from the wanton tyranny that rules his outward life; proudly defiant of the irresistible forces that tolerate, for a moment, his knowledge and his condemnation, to sustain alone, a weary but unyielding Atlas, the world that his own ideals have fashioned despite the trampling march of unconscious power.
>
> —*Russell*

Proctologic Surgery

Coloscopy: Endoscopic Examination of the Colon

B. RICHARD JACKSON, M.D.*
AND
MALCOLM R. HILL, M.D., F.A.C.S., F.I.C.S., D.A.B.**
LOS ANGELES, CALIFORNIA

IN the medical literature of the past few years, a number of authors writing on the problems associated with the diagnosis and treatment of diseases of the colon have referred to the use of a sterile sigmoidoscope introduced through a colotomy incision for endoscopic examination of the colon. This procedure is properly termed coloscopic examination, although this term is not well known. The term is likewise applicable to endoscopic examination of the colonic mucosa by the introduction of a sigmoidoscope through colonic stomas, as in colostomy, transversostomy and cecostomy. It is the purpose of this presentation to discuss and stress the importance of this valuable surgical procedure.

With the use of proctosigmoidoscopic study of the distal 10 inches (25 cm.) of the colon, diagnosis of disease of this segment of the bowel has been exact. Until coloscopic procedures came into use, diseases of the colon proximal to this segment have been diagnosed only by roentgen studies and surgical exploration of the abdomen. All surgeons are aware of the limitations of both of the latter procedures. Under the best conditions, roentgen studies of the large bowel are unreliable in the diagnosis of small polyps. They are far from adequate in the diagnosis of any lesion less than 1 cm. in diameter, particularly if the lesion is sessile. In our experience, coloscopic study has revealed the presence of lesions impossible to discover by repeated roentgen studies and the most careful and repeated inspection and palpation of the entire bowel during laparotomy.

Bacon, who has been using this procedure since 1944, observed a rate of error of 9 per cent in roentgen studies when a coloscopic procedure was used.[1] Certainly this percentage will vary with roentgen technics and interpretations. It is unfortunate that some roentgen studies are limited to the use of the so-called opaque barium enema, and others to the use of only a double contrast study. Either study, if relied on exclusively, will fail to disclose polyps and other lesions. In our opinion,

---

From the Department of Proctology, Section of Surgery, College of Medical Evangelists School of Medicine.

*Fellow and Instructor in Medicine.

**Professor and Head of the Department of Proctology.

Read at the Twentieth Annual Congress of the United States and Canadian Sections, International College of Surgeons, Philadelphia, Sept. 12-15, [illegible].

Submitted for publication Sept. [illegible].

an opaque barium enema study should be done first and followed with a double contrast study. We have been impressed with the double contrast technic with "baridol," described by Jones and his co-workers of Stanford Medical School,[2] and more recently the use of "barotrast" as developed by Foster. With newer and better roentgen technics to be anticipated, the percentage of missed diagnoses of lesions of the colon will be decreased. Nevertheless, until the time when roentgen diagnosis of all lesions of the colon is 100 per cent accurate, coloscopic study will remain a valuable adjunct in the diagnostic armamentarium.

Deddish and Fairweather have reported their observations in 99 patients examined coloscopically. Of 76 patients subjected to laparotomy because of roentgen evidence of polyps, 50 per cent had additional mucosal lesions. Of 23 patients in whose cases a diagnosis of carcinoma of the colon had been established, 65 per cent had associated benign polyps not seen by roentgen ray.[3] It is our opinion that coloscopic study is indicated far more often than its occasional use at present would imply.

Indications. — Polyps and Malignant Change: When a polyp of the lower 10 inches (25 cm.) of the bowel is diagnosed by proctosigmoidoscopic means there is a mandatory indication for roentgen studies of the large bowel to rule out the presence of additional lesions above the reach of the scope. In our opinion, when transabdominal colotomy or resection is indicated for removal of a polyp, coloscopic study is mandatory to rule out multiple lesions. It has been the practice of some surgeons[4] to insert the examining finger through the colotomy incision, after finding a polyp in that segment of the bowel, and palpate the proximal and distal loops for a distance up to 8 inches (20 cm.). This is a far better practice than is examination of the external surface of the bowel. Even this procedure, however, will fail to reveal some small lesions that can be discovered coloscopically, especially in obese patients or in those cases in which previous surgical procedures or infectious

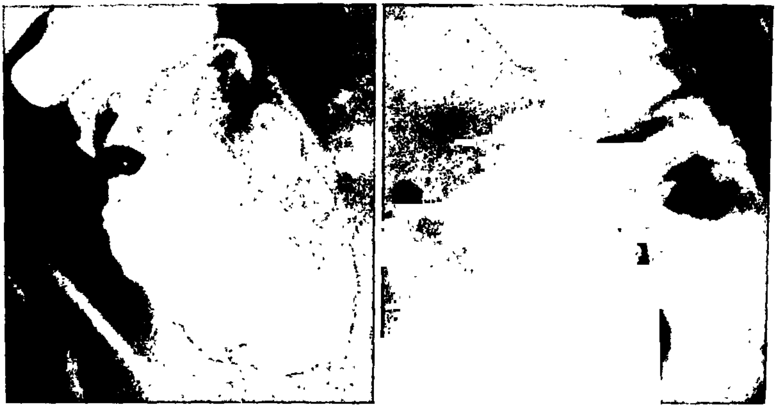


Fig. 1.—Roentgen evidence of carcinoma of cecum and lesion of left half of colon associated with diverticulosis. Lesion of left colon not palpable at [illegible]

processes have caused scarring or adhesions (Figs. 1 and 2).

We agree with Miller,[5] who has stated that, since it is impossible to predict which polyps will become malignant, all polyps must be regarded as premalignant lesions and removed or destroyed at an early date. The size of a polyp has nothing to do with its potential malignancy. Tiny sessile hyperplastic excrescences, referred to as "raindrop" polyps because of their appearance, are probably forerunners of larger lesions. Even these small lesions have been observed upon occasion to contain adenocarcinoma.[6] This type of polyp can be diagnosed only by visualizing it on the mucosal surface. Through the scope these tiny lesions, often multiple, can be treated appropriately, usually by simple destruction with the cautery.

Statistics have indicated that 80 to 85 per cent of polyps of the colon occur on the left side, between the splenic flexure and the anorectal line. When there is an indication for colotomy in this segment, coloscopic visualization of this segment is likewise indicated. When there is evidence of a polyp in the right or transverse portion of the colon, coloscopic study of the entire colon is indicated.

What we have said with regard to polyps holds true for carcinoma of the colon. It has been our practice to have barium enema and air contrast studies done preoperatively on all patients with malignant disease of the anorectum and colon. In spite of this precaution to rule out multiple lesions, it was our misfortune and embarrassment a year ago to have a patient present herself at the postoperative clinic with a small pedunculated adenoma protruding from the abdominal colostomy. Had coloscopic study been done at the time of operation, this polyp would have been removed.

In a patient who has a carcinoma with impending obstruction, when preoperative barium studies are not deemed advisable because of the possibility of completing the obstruction, coloscopic study of the colon is positively indicated.

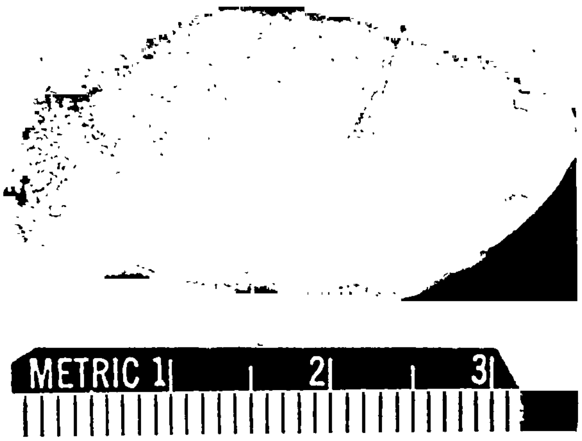


Fig. 2.—Submucosal pedunculated lipoma of left half of colon diagnosed coloscopically and excised through colotomy.

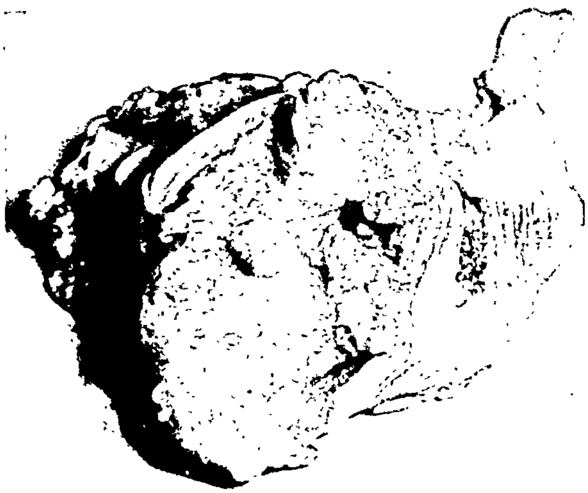


Fig. 3.—Large carcinoma occurring in proximal limb of transversostomy, diagnosed coloscopically and resected.

Bleeding of Undetermined Origin: Most surgeons who have had active residencies and practices have met patients who complain of bleeding from the rectum, in whose cases repeated preoperative studies have failed to disclose the source and cause. When all studies have so failed, laparotomy is undertaken. Even with the most careful and repeated inspection and

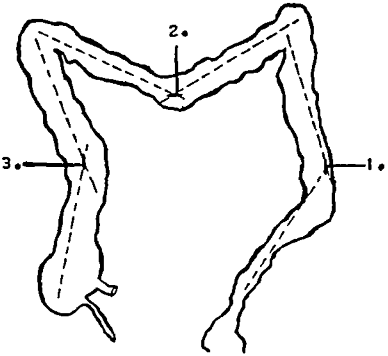


Fig. 4.—Usual three colotomy incisions for coloscopic visualization of the entire colon.

palpation of the entire abdominal gastrointestinal tract, there is an occasional patient in whom the cause of bleeding is not found. Here, then, is the patient deserving of coloscopic investigation. In these circumstances we do not consider it justifiable to close the abdomen unless complete coloscopic study has been done.

Diverticulosis and Diverticulitis: Not infrequently we encounter a patient who has bleeding from the rectum, but no other symptoms, and roentgen evidence of multiple diverticula of the entire colon without evidence of diverticulitis. Although some of these patients are treated expectantly and conservatively with blood transfusions, coagulants, iron and liver extract, etc., a number of them, after repeated and often severe hemorrhages, come to operation for exploration. Not uncommonly, in these cases, the source of bleeding is still undetermined after laparotomy, and resection of the sigmoid is done empirically. We have no argument with the theory that the source of bleeding is in the sigmoid in a substantial number of these cases. We are convinced, however, that coloscopic study at the time of laparotomy will often be helpful in locating the bleeding segment. If it should fail, we can at least say for certain that there are no other lesions responsible for the bleeding.

The presence of diverticula, diverticulitis, or the residual changes due to this disease, often renders the roentgen demonstration of small adenomas or invasive lesions difficult or even impossible. In the presence of diverticular disease the continued or intermittent presence of small amounts of blood as noted in the stool or seen on the bowel wall during sigmoidoscopic examination is of extreme significance. This type of bleeding seldom occurs from diverticula. Frequently it indicates the existence of a polypoid or invasive lesion.[7]

Colostomy Stomas: Many surgeons have followed their patients with colostomies for years. The usual check-up examination of these patients consists of careful palpation of the abdomen and the scars, and insertion of the examining finger into the stoma. Several cases in our more recent experience have taught us the value of including coloscopic study routinely in the examination. One patient was operated on eleven years ago; a diversion transversostomy was performed because of the presence of a sigmoidovesical fistula due to diverticulitis. Last year this patient, who had refused further surgical intervention for repair of the fistula, began to pass gas and feces into the bladder again. He was operated on, and a mass was palpated between the two limbs of the transversostomy, which was thought to be due to perforation of a diverticulum and thus resulting in canalization between the two limbs. Because of the poor condition of the patient, a temporary cecostomy was done. Although there was some general improvement, the cecostomy did not divert the fecal stream from the bladder, and a coloscopic procedure was performed in the proximal limb on one of his postoperative visits. A large carcinoma was observed; this had caused the channeling. Since resection of the entire transverse and descending colon, the patient has had no further complaints (Fig. 3).

Another patient recently operated on, 81 years old, had been followed for nineteen years after combined abdominoperineal resection for adenocarcinoma of the rectum and squamous cell carcinoma of the anal canal. Coloscopic study of the colostomy, done as a routine office procedure, disclosed an adenoma on a long pedicle 6 inches (15 cm.) proximal to the stoma. Roentgen studies revealed two other lesions near the splenic flexure.

Segmental Ulcerative Colitis: In the presence of this less common form of dreaded disease, roentgen studies and even examination of the bowel at operation will fail to reveal the exact segmental limitation of the lesion. Before we decide on the amount of colon to be resected, we consider it wise to obtain endoscopic visualization of the supposedly uninvolved mucosa adjacent to the disease process. Theoretically it is possible to postulate that there might be a lessened rate of recurrence if this procedure were performed and no visible involvement of the adjacent mucosa allowed to remain.

Contraindications. — With experience and teamwork, the coloscopic technic does not appreciably lengthen an operation on the bowel, whether it is a simple colotomy and excision of a polyp, resection and anastomosis, or resection and colostomy. The one definite contraindication to this procedure is the patient's inability, because of poor condition, to withstand the additional procedure. Impending shock, poor anesthesia, severe blood loss and cardiac or respiratory complications are all valid reasons for hastening the completion of the operation without the addition of coloscopic study.

Of course, this procedure is not indicated if the bowel is not properly prepared; and there seems to be no justification for its use where there is diffuse disease of the entire bowel, as in cases of diffuse chronic ulcerative colitis or familial polyposis.

Preparation of the Colon. — Successful coloscopic study depends largely upon proper preparation of the colon. Not only must the bowel be emptied of feces, but an attempt should be made to sterilize the bowel of pathogens, as one does when resection is contemplated. Ideally these patients should have absolutely nonresidual liquid diets for two days prior to operation. Two ounces of castor oil, or three doses of 1 ounce of 50 per cent magnesium sulfate, should be administered two days before the operation in order to clean out whatever residue is present.

To reduce the number of bacterial pathogens, a course of antibiotics is indicated. We favor oral streptomycin or terramycin for forty-eight hours before the operation. It has been our experience that a five-day preparation with sulfaphthaladine leaves a gummy residue in the bowel. A five-day preparation with sulfasuxidine

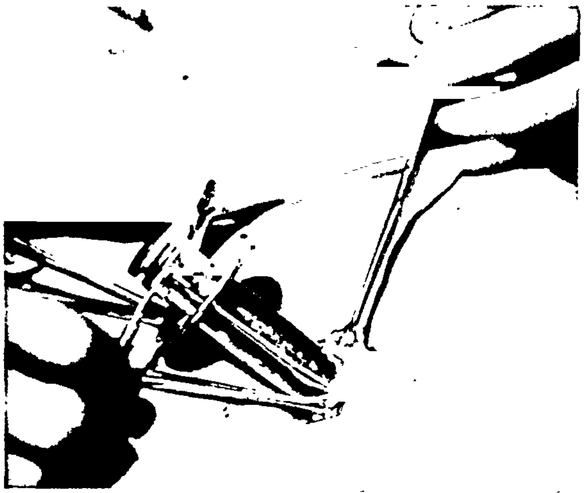


Fig. 5.—Introduction of scope, undertaken only after carefully packing off the peritoneum and abdominal wound, making the colotomy incision and grasping the edges of the wound with Babcock forceps.

or a two-day preparation with neomycin leaves a large amount of thickened liquid in the bowel.

On the day before the operation our patients are given small doses of paregoric and, that night, cleansing tap water enemas. A rectal tube with the Wangensteen type of suction placed in the rectum for two or three hours before the operation is also helpful in emptying the rectum and colon of residual fluid.

Technic. — Relaxation of the abdomen by good anesthesia is of major importance. With the scope inserted through an incision in the bowel, the abdomen must be free of pushing; good exposure is a necessity. We favor the use of spinal anesthesia. When this is contraindicated, inhalation mixtures and intravenous pentothal, supplemented with muscle relaxants, can be quite adequate.

We have found that the lower left abdominal paramedian incision, extending from 1 inch (2.5 cm.) above the pubic spine to 1 inch (2.5 cm.) above the umbilicus gives excellent exposure. The left rectus muscle is retracted laterally. On occasion, especially in obese patients, the transverse incision in the lower left quadrant, just below the level of the umbilicus, may give better exposure. With this incision, the left rectus muscle is transected.

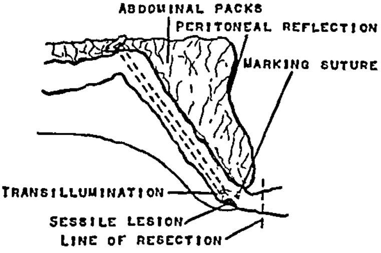


Fig. 6.—Distal lighted sigmoidoscope transilluminating bowel at level of lesion, marking suture placed.

If necessary, the right rectus can be transected in a like manner after the skin incision has been extended to the right.

Before incisions are made in the bowel, the area of incision must be packed off from the rest of the peritoneal cavity and the abdominal incision in case of spillage and contamination. This is accomplished with double thicknesses of abdominal packs. As with proctosigmoidoscopic procedures, a long suction tip and other sigmoidoscopic instruments, including long cotton swabs, biopsy forceps and cautery, must be readily available and in working order.

For coloscopic study of the entire colon, three colonic incisions are necessary. These incisions are made in the ascending colon, midway between the cecum and the hepatic flexure; in the midtransverse colon, and at the juncture of the descending and sigmoid colon. In the occasional case in which the right half of the colon is short, the incision is placed in the cecum (Fig. 4). In these sites the bowel wall is incised in the anterior taenia. The incision is just long enough to admit the scope, usually about 1 inch (2.5 cm.). As soon as the mucosa has been incised, the edges of the wound are grasped with Babcock visceral forceps and elevated (Fig. 5) while suction is applied to the lumen contents. The sigmoidoscope is introduced and passed its full length distally and proximally, with direct visualization of the entire mucosal surface. With unusually long or redundant segments of bowel, the scope can be passed with one hand and the other hand used to arrange the additional bowel in accordion fashion around the scope. Care must be taken that there is no contamination from the face or mask of the examiner, and the scope, upon removal, should be suitably sterilized before it is used on another segment of the bowel. As each segment is examined, the colotomy is closed by the two-layer technic, the mucosa being inverted just as in any closure of bowel.

We prefer to use a sigmoidoscope with a distal light source. If a lesion is visualized, even though not palpable, the transillumination of the distal light will serve as a guide either for making an incision in that area for the simple excision of a polyp, or for the placing of a marking suture if the segment is to be resected. We have found the latter maneuver invaluable in establishing the distal line of resection of small sessile carcinomas at, or just above, the pelvic peritoneal reflection (Fig. 6).

In recent years we have been impressed with a number of reports in the literature concerning local recurrences of carcinoma due to local implants at the suture line of anastomoses. In 1951 Cole, and later Goligher and his associates, reported ample evidence that at least half of recurrences at the suture line were due to local implants of intraluminal desquamated cells.[8] In 1954, McGrew, Laws and Cole reported that viable desquamated malignant cells were present in 42 per cent of proximal ends and in 65 per cent of distal ends of resected specimens at average distances of 10 and 21 cm.[9] In the same year, Cole and Southwick advocated routine ligation of the lumen of the colon several inches above and below the tumor before mobilization of the involved intestine is begun, in order to prevent intraluminal spread of this type.[10] This year Pomerantz and Garlock have introduced the use of a colon cover for the involved segment, secured by sutures placed proximal and distal to the lesion occluding the lumen.[12]

In the presence of carcinoma of the colon, the lumen above and below the lesion should be occluded by ligation. Introduction of the sigmoidoscope into the segment of bowel to be resected is absolutely contraindicated. When suspicious lesions are discovered coloscopically, the resection should include several inches of bowel beyond the site of introduction of the scope.

Complications. — Paralytic ileus is the most common complication of coloscopic study. Although it is not of serious consequence, usually subsiding within forty-eight hours, this complication has been constant in our experience. Other complications that might be expected to occur occasionally with increased use of this procedure are perforation, abscess and peritoneal infection, hemorrhage and wound infection. With care and experience, the incidence of these complications should certainly be reduced to a very low level.

SUMMARY

Coloscopy is a valuable surgical procedure. Its particular value is in the diagnosis of small lesions of the colon unrevealed by roentgen studies and laparotomy and in determining the presence or absence of multiple pathologic processes.

The authors describe the indications and contraindications for the procedure, the preparation of the colon, the technic and the complications. More frequent use of coloscopic procedures will contribute to our more successful diagnosis and treatment of diseases of the colon.

RÉSUMÉ

La côloscopie est un moyen diagnostic utile. Elle est très efficace pour faire le diagnostic despetites lésions du côlon invisibles aux rayons-X et même à l'examen pendant la laparotomie.

L'auteur parle des indications et des contre-indications de la côloscopie, la préparation préoperatoire du côlon, de la technique de la côloscopie et de ses complications.

Il préconise l'application de ce moyen d'examen dans un plus grand nombre de

cas pour assurer un diagnostic correct et un traitement efficace.

SUMÁRIO

A coloscopia consitutui um metodo cirurgico de valor, particularmente no diagnostico de pequenas lesões do colo, não reveladas por estudos radiologicos e laparotomia e para a determinação da presença ou ausencia de processos patologicos multiplos.

O Autor descreve as indicações e contraindicações do processo, o preparo do colo, a tecnica eas complicações. O uso mais frequente da coloscopia contribuirá para o diagnostico com maior sucesso e para o tratamento das molestias do colo.

RIASSUNTO

La colonscopia è un metodo utile nella diagnosi delle lesioni ciroscritte del colon che sfuggono all'indagine radiologica, e sopratutto per determinare la presenza o l'assenza di lesioni multiple.

L'autore elenca le indicazioni e le controindicazioni del metodo, il modo di preparare il colon, la tecnica e le complicazioni. Un uso più generalizzato della colonscopia porterà certamente un miglioramento nella diagnosi e nella terapia delle malattie del colon.

REFERENCES

1 Bacon, H. E.: Personal communication.

2. Jones, H. H.; Kaplan, H. S., and Windholz, F: Air Contrast Colon Examination with Colloidal Barium, Radiology 56:561, 1951.

3. Deddish, M., and Fairweather, W. H.: Colotomy and Coloscopy, Cancer 6:1021, 1953.

4. Klein, R. R., and Scarborough, R. A.: Diagnosis and Treatment of Adenomatous Polyps of *the Colon, Arch. of Surg. 65:65, 1953.* Hawthorne, H. R.: The Management of Polyps of the Colon and Rectum, S. Clin. North America 32:1799, 1952.

5. Miller, D.: Sigmoidoscopy: Procedure of Choice for Detection of Pre-Malignant Lesions of the Colon and Rectum, Am. Pract. and Dig. of Treat. 5:640, 1954.

6. Weingarten, M., and Turell, R.: Carcinomatous Mucosal Excrescences of the Rectum, J.A.M.A. 149:1467, 1952.

7. Fansler, W. A.: Roentgenological Studies of the Colon, J. Michigan State M. S. 54:467 1955.

8. Cole, W. H.: Measures to Combat the Menace of Cancer, Am. Surgeon 17:660, 1951. Goligher, J. C.; Dukes, C. E., and Bussey, H. J. R.: Local Recurrences After Sphincter-Saving Excisions for Cancer of the Rectum and Rectosigmoid, Brit. J. Surg. 39:199, 1951.

9. McGrew, E. A.; Laws, J. F., and Cole, W. H.: Free Malignant Cells in Relation to Recurrence of Carcinoma of the Colon, J.A.M.A. 154:1251, 1954.

10. Cole, W. H., and Southwick, H. W.: Carcinoma of the Colon with Special Reference to Prevention of Recurrence, J.A.M.A. 155:1549, 1954.

11. Pomerantz, A. A., and Garlock, J. H.: Postoperative Recurrence of Carcinoma of the Colon Due to Desquamated Malignant Cells, J.A.M.A. 158:1434, 1955.

> Upon the very books in which philosophers bid us scorn ambition, they inscribe their names. They seek publicity for themselves on the very page where they pour contempt upon publicity.
>
> —*Cicero*

Limitations of the Injection Treatment of Hemorrhoids

GEORGE J. RILLING, M.D., F.A.C.S., F.I.C.S., D.A.B.

PHILADELPHIA, PENNSYLVANIA

IN order to discuss the limitations of the injection treatment of hemorrhoids one must make a correct diagnosis, properly select one's cases, know the limitations of the solution to be injected, recognize the contraindications and the complications that may occur and consider the results one plans to accomplish.

A proctosigmoidoscopic study should be made before instituting any treatment for hemorrhoids, to assure oneself that there is no active or latent disease of the anorectum or lower portion of the sigmoid.[1] Only when more serious causes of bleeding have been ruled out should injection therapy be performed.

The injection treatment is a legitimate procedure, recognized and generally accepted by the profession. It has been adopted and frequently used by nearly all proctologists, depending upon the type of hemorrhoid encountered. It is not the treatment of choice in all cases; neither should it be condemned in favor of other surgical procedures. Its value should be estimated in connection with every hemorrhoidal problem.[2]

External hemorrhoids should never be treated by injection; hence, injection should be limited to certain other types of hemorrhoids.

An analysis of the records of the 500 patients who came recently to my office is presented in Table 1. Of the 500 new patients represented in Table 1, 226, or 45.2 per cent, were without internal hemorrhoids, and 274, or 54.8 per cent, had internal hemorrhoids. This is about the average proportion as reported by other proctologists.

Table 2 contains data on 274 patients with internal hemorrhoids. In 37, or 13.5 per cent, these were present without other anorectal pathologic conditions. Of these, 19, or 6.9 per cent, had nonprolapsing internal hemorrhoids. Thirteen, or 4.8 per cent, had internal hemorrhoids that prolapsed and reduced themselves. Five, or 1.8 per cent, had internal hemorrhoids that prolapsed and had to be reduced digitally.

The patients with internal hemorrhoids and other anorectal disease numbered 237, or 86.5 per cent. Of these, 102, or 37.2 per

TABLE 1.—*Data on 500 New Patients*

With Internal Hemorrhoids 274 (54.8%)
Without Internal Hemorrhoids 226 (45.2%)

TABLE 2.—*Data on 274 Patients with Internal Hemorrhoids*

	Without Other Anorectal Lesions	*With Other Anorectal Lesions*
Nonprolapsing internal hemorrhoids	19 (6.9%)	102 (37.2%)
Internal hemorrhoids that became prolapsed and reduced themselves	13 (4.8%)	67 (24.5%)
Internal hemorrhoids that became prolapsed and had to be reduced digitally	5 (1.8%)	68 (24.8%)

Read at the Twentieth Annual Congress of the United States and Canadian Sections, International College of Surgeons, Philadelphia, Sept. [illegible].

Submitted for publication Sept. 21, [illegible].

cent, had non-prolapsing internal hemorrhoids, and 67, or 24.5 per cent, had internal hemorrhoids that prolapsed and reduced themselves. In 68, or 24.8 per cent, the internal hemorrhoids were prolapsed and had to be reduced digitally.

If the selection is limited to cases of nonprolapsing internal hemorrhoids without other anorectal disease, I can select only 6.9 per cent.

I realize that these limits could be extended if I included the cases of nonprolapsing internal hemorrhoids associated with other anorectal disease, by removing or treating the associated lesions and subsequently treating the internal hemorrhoids by injection.

Again, it is known that a certain percentage of patients affected with internal hemorrhoids which become prolapsed and reduce voluntarily, and are unassociated with other anorectal pathologic lesions, will usually respond to injection. In this way the limitations of selection could be extended, depending on the surgeon's enthusiasm for the injection treatment.

The associated anorectal lesions complicating the internal hemorrhoids encountered in this series of cases were: external skin tags; external thrombotic hemorrhoids; anal cryptitis; hypertrophied anal papillae; anal fissure; ischio-anal abscess; pelvorectal abscess; rectal polypi; prolapsed rectal mucosa; anorectal fistulas; ulcerated, fibrotic, strangulated and gangrenous hemorrhoids; radiation proctitis; ulcerative proctosigmoiditis; pruritus ani; epithelioma, and carcinoma of the rectum.

The hemorrhoidal lesions are usually well advanced before one sees the patient, because patients tend to delay diagnosis and treatment. Naturally the condition becomes complicated by other anorectal disturbances.

It is unwise to make use of the injection treatment without removing the associated anorectal lesions, since this relieves only part of the disease.[3]

No attempt is made to destroy the veins by using a strong solution, which would cause sloughing. A weaker or sclerosing solution is injected into the submucosa and into the tissues surrounding the radicles of blood vessels; this produces an inflammatory reaction, causing obliteration of the radicles of the hemorrhoidal veins by thrombosis to control bleeding, followed by fibrosis to fix and draw up the redundant mucosa.[4]

Many solutions can be used for the injection treatment of hemorrhoids, but the preferred way is to introduce a solution that is nontoxic and sufficiently irritating to cause adhesions, but not so strong as to produce a slough.[5]

Only by experience can one determine the amount of solution that should be injected and the frequency of injections.[6] Any hemorrhoid showing signs of induration from a previous injection should not be again injected until the induration has subsided and the mass has softened. The interval between injections should, therefore, not be governed by time.

At present most physicians are using mild sclerosing agents such as 5% quinine urea hydrochloride, 5% phenol in vegetable oil, or quinuride solution.

However, some physicians must have their own "special formula," in view of the fact that they claim to be getting better results.

I have found no advantage in using more than one sclerosing solution in the treatment of large nonprolapsing internal hemorrhoids.

Five per cent quinine urea hydrochloride or quinuride should not be injected into a patient who has an idiosyncracy to quinine. Likewise, it should be prohibited in pregnancy. During pregnancy I use 5 per cent phenol in oil to avoid the harmful effects of quinine.

F. B. Campbell[7] has stressed the fact

that a spastic sphincter and tenderness probably indicate infection and proposes a rule: When in doubt, do not inject.

For external-internal hemorrhoids operation is advised. Some physicians, however, inject the internal portion to control bleeding and reduce the size of the hemorrhoid. The solution may infiltrate areas distal to the pectinate line and involve the external sphincter muscle, causing a slough that may destroy a portion of the external sphincter muscle and interfere with continence.

In the presence of senility or disease causing general debility, such as diabetes, cardiorenal disease, tuberculosis, asthma or severe anemia, the patient is a poor surgical risk. Sclerotherapy is of value even though the benefits derived therefrom are temporary.

Patients with bleeding internal hemorrhoids who cannot spare the time from business, who will not submit to adequate surgical treatment or who fear an operation, should, by necessity, receive injection therapy. They should be informed, however, of its limitations.[8]

It is necessary to have a thorough knowledge of the complications that may occur during the course of injection treatment. All physicians who have so treated a number of hemorrhoids must admit that they have encountered sloughs. These sloughs are usually superficial and of no serious consequence. At times a hemorrhage may occur, and it is usually secondary to a slough. Severe pain, submucous abscess, marginal abscess and fistula, stricture, pylephlebitis and pyemia have been reported and are usually either the result of poor judgment in the selection of patients or of faulty technic.

Quinine sensitivity has been mentioned.

Prolapse may occur after injection, and the patient is warned to replace the prolapsed hemorrhoid, for, should it be allowed to remain, strangulation or gangrene may result.

It has been my policy to select for injection treatment the internal hemorrhoids which do not become prolapsed and are not associated with other anorectal lesions. In such cases the best results are obtained by the submucous injection of a mild sclerosing solution. The internal hemorrhoids that become prolapsed and reduce themselves are treated by injection only after it has been explained to the patient that these injections may give merely temporary relief and that a recurrence of the hemorrhoids may occur. Further injections can be given on the recurrence of prolapse or bleeding. For patients who are without associated anorectal disease and whose internal hemorrhoids were prolapsed and had to be reduced digitally, I use the injections for temporary control of bleeding until operation can be performed. As to the effects on the prolapse, very little improvement attributable to the injection treatment has been observed.

When minor anorectal pathology is associated with internal hemorrhoids, the surgical removal in one operation of both the hemorrhoids and the associated lesions is advised.

There are frequent recurrences following injection treatments. Some physicians are of the opinion that recurrences are due to insufficient treatments and additional injections are necessary.[9]

J. P. Nesselrod[8] has expressed the opinion that an infective process is present in an anal crypt, anal duct and anal gland. Hence, merely treating internal hemorrhoids by injection, without consideration of this etiologic factor, will result in failure as far as permanent cure is concerned.

In my own experience, most internal hemorrhoids are associated with other anorectal pathologic conditions in which anal cryptitis is a prominent factor. These hemorrhoids are not the type for injection therapy and should be removed surgically.

CONCLUSIONS

External hemorrhoids should never be treated by injection of a sclerosing solution.

The injection treatment of hemorrhoids should be limited to patients with nonprolapsing internal hemorrhoids and without other anorectal pathologic change.

Injection treatment is valuable for patients with internal hemorrhoids who are poor surgical risks, who refuse operation, or who are aged. It must be explained, however, that, although symptomatic relief may be obtained, a permanent cure cannot be promised.

The limits of the injection treatment of hemorrhoids can be extended for nonprolapsing internal hemorrhoids with associated anorectal pathologic change if the associated anorectal condition is treated, or surgically removed, and the hemorrhoids injected.

SCHLUSSFOLGERUNGEN

Äussere Hämorrhoiden sollten niemals mit Einspritzungen sklerosierender Lösungen behandelt werden.

Die Einspritzungsbehandlung von Hämorrhoiden sollte auf Kranke mit nicht prolabierenden inneren Hämorrhoiden und ohne andere Erkrankungen des Afters und Mastdarms beschränkt bleiben.

Die Einspritzungsbehandlung ist von Wert für Kranke mit inneren Hämorrhoiden, wenn die Patienten ein schlechtes chirurgisches Risiko darstellen oder die Operation ablehnen oder zu alt sind. Es muss ihnen aber klar gemacht werden, dass diese Behandlung zwar eine symptomatische Erleichterung verschaffen, aber keine dauernde Heilung garantieren kann.

Die Anwendbarkeit der Einspritzungsbehandlung kann auf nicht prolabierende innere Hämorrhoiden bei gleichzeitigem Bestehen anderer anorektaler Erkrankungen ausgedehnt werden, wenn diese Begleiterkrankungen behandelt oder chirurgisch entfernt werden können und sich die Einspritzungsbehandlung anschliessend ausführen lässt.

RIASSUNTO

Le emorroidi esterne non devono mai essere trattate col metodo sclerosante. Questo metodo deve essere riservato ai malati con emorroidi interne non procidenti e senza altre lesioni anorettali.

La cura sclerosante è adatta a pazienti con emorroidi interne e in cattive condizioni generali, o avanti negli anni o quando rifiutino l'intervento chirurgico. Bisogna tuttavia che essi sappiano che la guarigione non può essere assicurata, anche se si ottiene un miglioramento dei disturbi.

Quanto alla presenza di lesioni anorettali associate, esse devono sempre essere curate chirurgicamente o, comunque, trattate a parte quando si esegue la terapia sclerosante.

CONCLUSIONES

Les hemorrhoides externes ne doivent jamais être traitées par l'injection d'une solution sclérosante.

Le traitement des hémorrhoides par injection doit être limité à des patients avec des hémorrhoides internes et sans aucune autre lésion pathologique ano-rectale.

Le traitement par injection est valable pour des malades qui sont atteints des hemorrhoides internes et qui sont trop affaiblis pour subir une opération, pour ceux qui refusent l'opération ou qui sont trop agés. Aussi faut il expliquer que, malgré que les symptômes disparaitront, on ne peut pas promettre une cure permanente.

Les limites du traitement des hémorrhoides par injection peuvent être étendues à des hemorrhoides internes sans prolapsus, associées à une condition pathologique ano-rectale, si on prend soin de la

lésion ano-rectale, ou si on l'enlève chirurgicalément et injecte les hemorrhoides.

CONCLUSOES

As hemorroides externas nunca devem ser tratadas pela injeção de uma substancia esclerosante.

O tratamento das hemorroides por injeção deve ser limitado aos pacientes com hemorroides internas não prolapsadas e sem outra alteração patologica ano-retal.

O tratamento por injeção é de valia para pacientes com hemorroides internas e más condições gerais, que recusam o tratamento ou em pacientes idosos. Deve ser contudo explicado que, embora se obtenha alivio sintomatico, não se pode prometer cura permanente.

Os limites do tratamento das hemorroides por injeção pode ser extendido às hemorroides internas não prolapsadas com alteração patologica anoretal associada, desde que esta ultima seja tratada ou cirurgicamente extripada e as hemorroides injetadas.

REFERENCES

1. Turell, R.: Treatment in Proctology. Baltimore: The Williams and Wilkins Company, 1949.

2. Canter, A. J.: Injection Treatment of Hemorrhoids, M. Rec. 155:461, 1942.

3. Pruitt, M. C.: Choice and Evaluation of Methods in the Treatment of Hemorrhoids: Discussion by G. F. Eubanks, J.M.A. Georgia 458:61, 1937.

4. Marino, A. W.: Injection Treatment of Hemorrhoids, Am. J. Surg. 23:366, 1934. Gabriel, W. B.: Treatment of Hemorrhoids, Brit. M. J. 2:1266, 1939.

5. Fansler, W. A.: Injection Treatment of Hemorrhoids, J. Iowa M. S. 22:27-29, 1932. Connors, R. J.: Why Do Hemorrhoidectomies? M. Rec. 147:375-377, 1938.

6. Yaker, D. N.: Hemorrhoids: Slough Following Injection, Am. J. Surg. 56:684, 1942.

7. Campbell, F. B.: Serious Sloughs and Fistula Formation Resulting from Injection Treatment, Southern M. J. 38:268-271, 1945.

8. Nesselrod, J. P.: Proctology in General Practice. Philadelphia: W. B. Saunders Company, 1950.

9. Kilbourne, N. J.: Internal Hemorrhoids: Comparative Value of Treatment by Operation and Injection Methods, A. M. J. Surg. 99:600, 1934.

ADDITIONAL SOURCES

Fansler, W. A.: Injection Treatment of Hemorrhoids, Minnesota M. J. 15:98-100, 1932.

Dodson, J. H., and Dodson, M. H.: An Appraisal of the Injection Treatment of Internal Hemorrhoids, Southern M. J. 45:347-351, 1952.

Gorsch, R. V.: Hemorrhoids, Rev. Gastroenterol. 18:11, 859-877, 1951.

Terrell, R. V., and Chewning, C. C. Jr.: The Present Status of Injection Treatment of Internal Hemorrhoids, Am. J. Surg. 79:44-48, 1950.

No illumination can sweep all mystery out of the world. After the departed darkness the shadows remain, more mysterious because as if more enduring; and one feels a dread of them from which one was free before. What if they were to be victorious at the last? They, or perhaps what lurks in them: fear, deception, desire, disillusion—all silent at first before the song of triumphant love vibrating in the light. Yes. Silent. Even desire itself! All silent. But not for long!

—*Conrad*

Metastasis to Ureters and Urinary Bladder from Renal Carcinoma

Report of Two Cases

BENJAMIN S. ABESHOUSE, M.D., F.A.C.S., F.I.C.S., D.A.B.*
BALTIMORE, MARYLAND

THE occurrence of a secondary tumor in the bladder arising from a clear cell carcinoma of the kidney is rare and presents unusual problems in diagnosis, treatment and pathogenesis. The purpose of this paper is to report 2 such cases and discuss the incidence and pathogenesis of these unique secondary neoplasms.

REPORT OF CASES

CASE 1.—A 53-year-old white male physician was admitted to the urologic service of Dr. A. E. Goldstein at the Sinai Hospital on Nov. 6, 1924, with the complaint of hematuria of two weeks' duration. He had previously enjoyed perfect health. The hematuria was painless, intermittent and unaccompanied by other urinary symptoms or by fever. A firm, slightly irregular, nonmovable, nontender mass about 12 cm. in diameter was palpated in the left upper quadrant of the abdomen.

Cystoscopic and retrograde pyelographic studies were performed on November 8. The bladder was normal and showed no signs of a tumor. Retrograde pyelograms showed the characteristic defects of a neoplasm in the lower pole of the left kidney. Roentgenograms of the lungs and long bones revealed no abnormality.

On November 19th the left kidney was removed through a lumbar incision. The pathologic diagnosis was hypernephroma (clear cell carcinoma).

At examination on July 1, 1925, the patient was in excellent health. On Oct. 30, 1927, he returned, complaining of hematuria of two months' duration. Cystoscopic study revealed a large irregular tumor (3 cm. in diameter) on the left lateral wall of the bladder. Biopsy of the tumor revealed similar histologic changes as in the left renal neoplasm. The tumor area was extensively fulgurated. The patient's subsequent course was progressively downhill, and he died from the effects of metastatic pulmonary growths on December 2, thirty-seven months after removal of the kidney.

CASE 2 (Reported through the courtesy of Dr. W. W. Scott, Brady Urological Institute, Johns Hopkins Hospital).—A white male physician 58 years old was admitted to the Brady Urological Clinic on Feb. 5, 1951, complaining of painless hematuria of several weeks' duration. He had no other urinary symptoms. Physical examination disclosed a firm, round palpable mass in the left upper quadrant of the abdomen. Cystoscopic and retrograde pyelographic study on February 8 revealed no evidence of lesion within the bladder and the characteristic roentgenographic changes of a neoplasm in the lower pole of the left kidney. Roentgen films of the lungs and long bones were normal. On February 9 the left kidney was removed. Examination disclosed a large clear cell carcinoma involving the lower third of the kidney.

Approximately one year later (Feb. 1, 1952) the patient returned because of painless hema-

---

*Chief of the Department of Urology, Sinai Hospital, Baltimore, Maryland.
Submitted for publication Oct. 31, 1953

turia. Cystoscopic study revealed a tumor of the bladder, 1 cm. in diameter, situated immediately above the left ureteral orifice. The tumor was removed by transurethral resection and was reported as a clear cell carcinoma similar in histologic structure to the left renal neoplasm. A recurrence of the bladder tumor on June 5, 1952, was treated by transurethral resection. On July 18 the bladder tumor recurred again, and a suprapubic segmental resection of the bladder was performed, with similar histologic observations. Another bladder recurrence was observed on December 10, and open segmental resection of the bladder was performed again. When the patient returned for reexamination, on March 1, cystoscopic study revealed no evidence of a recurrence.

On June 8 he returned, complaining of pain in the lower lumbar area. Roentgenograms of the spine disclosed metastases in the fourth lumbar vertebra. Extensive high voltage roentgen therapy was given to the affected lumbar area, with slight improvement of symptoms. About two months later there developed physical and roentgen evidence of metastatic tumors in the lungs. The patient died on Sept. 1, 1953. Permission for an autopsy was denied.

The consensus today is that clear cell carcinoma of the renal parenchyma rarely metastasizes to other parts of the genitourinary tract. This opinion has not always prevailed, for in the urologic and pathologic monographs on renal tumors published in the latter half of the nineteenth century one finds the oft-repeated, though unconfirmed, statement that renal parenchymal tumors may be propagated downward into the renal pelvis, ureter and bladder by a process of implantation or grafting. This erroneous conception may be attributed to the meager pathologic and histologic technics of that era, when secondary tumors resulting from the dissemination of papilliferous tumor cells from a papillary carcinoma of the renal pelvis were often incorrectly diagnosed as a "hypernephromatous" metastases or implants.

In the recent urologic textbooks this pathologic entity is either mentioned as a rare possibility or disregarded entirely. The incidence of such metastases in the literature is indicated in the accompanying table.

A search of the literature reveals only 61 authentic cases of clear cell carcinoma of the renal parenchyma or hypernephroma metastasizing to other parts of the genitourinary tract. The ureter was the site of metastatic tumor in 15 cases, viz., 13 positive cases[1] and 2 doubtful cases.[2] The bladder was involved in 8 cases, viz., 7 positive cases[3] and 1 doubtful case.[4] The corpora cavernosa of the penis was the site of metastases in 3 cases, the epididymis in 2 cases and the testes in 3 cases. In the female, hypernephromatous metastases have been observed in the vagina in 27 cases; in the vulvourethral area in 1 case; in the ovary in 2 cases, and in the uterus in 1 case.

Differential Diagnosis. — Knowledge of the pathogenesis of vesical and ureteral metastases from clear cell carcinoma of the kidney may be enhanced by a consideration of the various pathologic conditions that may be confused with or closely simulate the aforementioned lesions.

1. *Papillary Carcinoma of the Renal Pelvis with Vesical and Ureteral Metastases:* It has been estimated that primary neoplasms of the renal pelvis comprise between 5 and 10 per cent of all renal tumors and that 85 per cent of the pelvic neoplasms are papillary carcinoma and 15 per cent squamous cell carcinoma. Approximately one-third of papillary carcinomas of the renal pelvis are accompanied by secondary tumors of the ureter or bladder or both.[5]

There is no unanimity of opinion concerning the pathogenesis of these secondary tumors. Some authors, including Hanseman, Ewing, Broders, McDonald and Priestly, Fagerstrom and Bothe, regard the multicentric origin of the neoplastic process as the logical explanation

Statistical Reports of Metastatic Tumors in the Genitourinary Tract from Renal Clear Cell Carcinoma (Hypernephroma)

Author and Year	*Primary Tumors of Renal Cortex*		*Secondary Tumors*					
			Ureter	*Bladder*	*Testis*	*Epididymus*	*Prostate*	*Scrotum*
Albarran and Imbert,[6] 1903	Adenocarcinoma Hypernephroma	188 85 273		1				
Garceau, E.: Renal, Ureteral, Perirenal and Adrenal Tumors. New York and London: D. Appleton-Century Company, 1909	Hypernephroma	176		1				
Schacht,[11] 1931	Hypernephroma	285	2					
Hand, J. R., and Broders, W.: J. Urol. 28:199, 1932	Carcinoma	193						
Creevy, C. D.: Arch. Int. Med. 55:895, 1936	Carcinoma Autopsy Clinical	 46 46 92	1	1	1	1		
Mintz, E. R., and Gaul, E. A.: New York State J. Med. 39:1405, 1839	Carcinoma	127						
Kozoll, D. D., and Kirshbaum, J. D.: J. Urol. 41:435, 1940	Carcinoma	44	5					
Melicow, M. M., and Gile, H. H.: J. Urol. 40:637-640, 1940	Clear cell carcinoma Hypernephroma	73 83 156			1	1	1	1
Nalle, B. C.: J. Urol. 57:662, 1947	Carcinoma	58	4	3				
Abeshouse,[8] 1954	Hypernephroma	105		1				
Tumor Registry, Armed Forces Institute of Pathology; Personal communication from Dr. Mostofi, 1953	Hypernephroma	1,200		2				
Total		2,709	12	9	2	2	1	1

of these secondary tumors in cases of papillary carcinoma of the renal pelvis. The proponents of this theory maintain that more than one center in the urothelial tract is affected by endogenous or exogenous carcinogens, and that the resulting neoplastic processes may appear as synchronous or asynchronous, single or multiple, isolated or coalesced tumors. This theory appears to explain adequately the frequent occurrence of secondary vesical and ipsilateral ureteral tumors and the rare occurrence of secondary contralateral ureteral tumors, before or after operation, in cases of unilateral primary papillary carcinoma of the renal pelvis or ureter. It also explains the tendency of single or multiple vesical or ureteral tumors to develop in cases of so-called benign papilloma of the urothelial tract. Further support of this theory is supplied by the study of Kaplan, McDonald and Thompson (1951), who reviewed 133 cases of papillary carcinoma of the renal pelvis and found 88 single and 45 multiple tumors.[5]

Other authors, including Albarran, Kimball and Ferris, Mackenzie and Ratner, and McAlpine,[6] attributed the development of multiple vesical or ureteral tumors in cases of papillary carcinoma of the renal pelvis as "graft implants" on the urothelial lining following the downward transportation of effete malignant cells by the urinary stream or by ureteral peristaltic action. The proponents of this theory maintain that it adequately explains the frequent development of papillary tumors in the bladder and in the lower third of the ipsilateral ureter, as well as the rare occurrence of tumors in the contralateral ureter in cases of papillary carcinoma of the renal pelvis. From an anatomic, physiologic or pathologic standpoint it is difficult to explain the attachment or implantation of loose malignant cells on the urothelial lining in the absence of obstruction and inflammation below the site of the primary lesion.

Implantation in a retrograde manner has been suggested by Mortensen and Murphy as the responsible mechanism, viz., tumor cells pass in the direction opposite to the urinary flow. This theory is not supported by repeated clinical or pathologic studies, which show that primary papillary neoplasms of the bladder are rarely accompanied by secondary tumors in the upper two-thirds of the ureter or the renal pelvis. These studies have shown that involvement of the lower third of one or both ureters in cases of primary papillary carcinoma of the bladder is the result of direct extension and infiltration of the neoplastic process rather than of ureteral reflux, lymphatic spread or implantation.

Multiple tumors of the bladder and ureter associated with papillary carcinoma of the renal pelvis exhibit the same histologic features as does the pelvic tumor, show a marked tendency to recur, respond poorly to fulguration or operation and eventually metastasize to adjacent and distant organs.

Squamous cell carcinoma of the renal pelvis exhibit a marked tendency to spread by direct extension or infiltration into the adjacent calyces and the upper part of the ureter. I have observed 2 cases in which extension into the upper part of the ureter occurred.

2. *Vesical and Ureteral Metastases from Other Renal Neoplasms:* There are very few reports in the literature of secondary vesical and ureteral tumors associated with other renal neoplasms, exclusive of clear cell carcinoma of the cortex and papillary carcinoma of the renal pelvis. Lattes[7] (cited by Melicow; see table) and Garrett and Mertz (1953) reported individual cases of vesical metastases associated with Wilms' tumor of the kidney. These secondary tumors are due to arterial dissemination or retrograde venous embolism rather than to retrograde lymphatic permeation or implantation.

3. *Vesical and Ureteral Metastases Associated with Primary Ureteral Tumors:* I have recently reviewed 198 primary malignant and 60 benign tumors of the ureter and observed secondary tumors of the bladder in 19 cases of malignant and 1 case of benign disease. In the latter case the tumor should be regarded as a malignant or potentially malignant neoplasm. Multiple tumors of the ureter were present in 24 cases of malignant and 4 cases of benign disease. It was practically impossible to determine whether or not these multiple tumors were primary or secondary, synchronous or asynchronous. All of the secondary tumors were of the papillary transitional cell variety.

4. *Metastatic Tumors of the Ureter and Bladder from Extrarenal Neoplasms:* In this article I have intentionally omitted the relatively common type of secondary vesical and ureteral tumors resulting from direct extension or infiltration from a primary carcinoma of the male or female pelvic organs, viz., prostate, seminal vesicles, bladder, uterus, cervix and ovaries. Attention is directed to those secondary tumors of the bladder and ureter which reach these organs by way of the blood stream or the lymphatics.

True metastatic tumors of the ureter are extremely rare. In 1951 McCrea and Peale[9] collected 41 cases, and I have gathered 27 additional cases.

True ureteral metastases are usually accompanied by metastases to other organs. The lesions are bilateral in approximately 60 per cent of the cases and involve the upper and the lower portion of the ureter with equal frequency.

Watson and his associates[10] reviewed the autopsy observations in 80 cases of lymphoblastoma and noted vesical metastases in only 5 cases of lymphosarcoma. Klinger[11] reviewed 5,000 autopsies and collected 142 cases in which there were secondary tumors in the genitourinary tract. In the majority of these cases (95) multiple portions of the urinary tract were involved. Vesical metastases were combined with other secondary tumors in the genitourinary tract in 33 cases and were unaccompanied by other secondary metastases in 13 cases. Klinger also observed 1 case of carcinoma of the kidney with metastases to the penis, causing priapism. Tumors of the ureters were involved in 7 cases; in 1 case alone and in the others combined with other secondary tumors. It is interesting to note that in none of the 66 cases of metastatic ureteral tumors collected by the author were the lesions associated with primary renal hypernephroma.

5. *Multiple Primary Tumors Involving the Kidney and/or the Bladder or Ureter:* The synchronous and asynchronous occurrence of multiple primary tumors within the genitourinary tract is uncommon but quite familiar to the experienced pathologist. The most common type of multiple primary tumors is a combination of two or more neoplasms involving the skin, the gastrointestinal tract and the breast.

Kretschmer (1938) reported 5 cases of multiple tumors involving the urinary tract.[12] In only 1 case were a papillary carcinoma of the bladder and a hypernephroma of the right kidney present. Kaminsky (1949) observed 3 cases of multiple tumors involving the kidney and the bladder.[13] Cases of adenocarcinoma of the renal cortex associated with a papillary carcinoma of the bladder have been reported.[14] Goldstein and Rubin (1948) reported an unusual case of a patient with 4 metachronous primary tumors from this clinic, viz., multiple papillary carcinoma of the bladder, adenocarcinoma of the sigmoid, right hypernephroma and basal cell carcinoma of the skin.[15]

In the majority of the aforementioned cases the vesical carcinoma presented the first important clinical symptoms, attention being drawn later to the renal tumor, which in some instances was discovered only at autopsy.

Pathogenesis.—There is no unanimity of opinion concerning the pathogenesis of bladder metastases in cases of clear cell carcinoma of the kidney. The following pathways have been proposed:

1. *Direct Extension:* The proponents of this theory have maintained that if an extrinsic neoplasm, i.e., rectal adenocarcinoma (Boger,[16] 1928), is capable of invading the urinary passages and giving rise to implants in these passages, the same capacity in a higher degree must be present in tumors indigenous to the urinary tract. This is pure theoriz [illegible] how-

ever, and is not consistent with the observations at operation and autopsy in large series of cases of neoplasms of the kidney in which there may be an occasional instance of a parenchymal neoplasm invading the renal pelvis—rarely, if ever, with continuous extension to the ureter or bladder.

2. *Urogenous Route:* It is generally acknowledged that the occurrence of secondary tumors of the ureter and bladder in cases of papillary carcinoma of the renal pelvis may be due either to the multicentric origin of such papilliferous tumors or to the implantation into the urothelium of the ureter or bladder of viable tumor cells from the primary pelvic tumor. Most recent writers consider the latter mechanism responsible for metastases to the ureter and bladder in cases of clear cell carcinoma.

The proponents of this theory offer the following evidence in favor of this mechanism: 1. Recent cytologic studies of the urinary sediment in cases of clear cell carcinoma and hypernephroma reveal a consistently high incidence of viable tumor cells in the urine of patients not surgically treated. 2. Viable tumor cells from parenchymal as well as pelvic tumors have been successfully transplanted from one species (man) to the eye of another (rabbit) by Green, Hovnanian and Deming.[17] 3. It is assumed that viable tumor cells are dislodged from the parent tumor before or during operation and are transported downward in the urine to become implanted in the urothelium of the obstructed or nonobstructed, inflamed or noninflamed ureter or bladder.

The following evidence is in opposition to this theory: 1. There is a marked disparity between the high incidence of tumor cells in the urine of patients with clear cell carcinoma and hypernephroma not treated by operation and the rare occurrence of secondary tumors of the ureter and bladder in a large series of patients at operation or autopsy. 2. In cases of clear cell carcinoma and hypernephroma, the dissimilarity in the histio-ontogenetic features of the parent tumor (derived from tubular epithelium) and the type of epithelium at the site of the secondary tumor (transitional cell urothelium) is certainly not conducive to the propagation by implantation of secondary tumors. 3. Operative trauma does not appear to be an important causative factor, for the condition has been observed in at least 3 nonsurgical patients with ureteral metastases; furthermore, it is veritably impossible to remove a large renal neoplasm by the lumbar, the transperitoneal or the transthoracic route without some degree of unavoidable manipulation of the tumor prior to ligation of the vascular pedicle and ureter, and yet one encounters very few cases of secondary tumor in the ureter and bladder, considering the countless number of nephrectomies performed for neoplasms. 4. An analysis of the reported cases indicates that obstruction and inflammation of the ureter and bladder were absent in practically all cases. Most large renal parenchymal tumors produce some degree of distortion of the pelviocalyceal system and displacement of the ureter on the affected side, and yet the accompanying urinary stasis rarely causes the implantation of viable tumor cells.

It is my opinion that some mechanism other than implantation is responsible for the development of secondary tumors in the ureter and bladder in cases of clear cell carcinoma or hypernephroma.

3. *Lymphogenous Route:* Several irrefutable facts militate against the acceptance of this mechanism: 1. In the reported cases there is a conspicuous absence of demonstrable evidence of involvement of the lymphatic vessels in the area immediately adjacent to the metastatic tumor. 2. Anatomically, direct or retrograde dis-

semination of tumor cells through the lymphatics is not very likely to occur, as the lymphatic drainage of the kidney, ureter and bladder do not form a continuous system. 3. The lymphatic drainage of the kidney, ureter and bladder is directed outward to the lymph nodes adjacent to the renal artery, the abdominal aorta and the common iliac and its two component arteries.

4. *Hematogenous Route:* Theoretically the hematogenous dissemination of tumor cells of a neoplasm of the renal parenchyma may be brought about in several different ways: (1) direct invasion of the renal venous system with extension into the inferior vena cava and heart, with subsequent dissemination to all parts of the body; (2) direct invasion of renal vessels (arteries and veins) and extension within or along the outer walls of these vessels as they pass out from the hilum and course down over the pelvis and ureter; (3) secondary and tertiary embolism; (4) retrograde venous embolism; (5) paradoxical embolism; and (6) extension through the lymphatics draining the kidney into the adjacent lymph nodes, thence into the thoracic duct and finally into the venous system (subclavian vein).

Some writers, including Scott, concede the rarity of clear cell carcinomatous and hypernephromatous metastases to the ureter and bladder and attribute the unusual localization of such secondary tumors to the vagaries of venous dissemination. A much more logical explanation of this rare pathologic phenomenon, however, may be found in the retrograde venous embolism.

Willis[18] (1934) and Martzloff and Manilove[19] (1949) have stressed the role of retrograde venous embolism in the development of metastases to the ureter, bladder, pelvic organs and genitalia in both male and female in cases of renal parenchymal neoplasms, particularly on the left side. Anson and his associates[20] (1940, 1947, 1948) have observed marked differences between the venous drainage of the right and left kidney which are not recognized or appreciated by the pathologist and urologist. They noted that the left sex vein (ovarian or spermatic) always joined the left renal vein, whereas this termination occurred on the right side in only 21 per cent of cases. They also showed that the left renal vein is the center of an intricate venous network. In 68 per cent of cases, the left renal vein was found to communicate with the adrenal, visceral, diaphragmatic and lumbar venous components, whereas the latter venous components terminate in the inferior vena

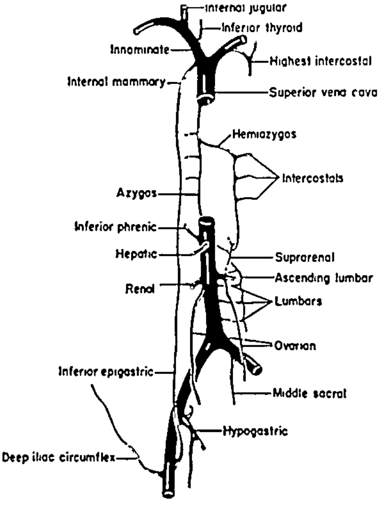
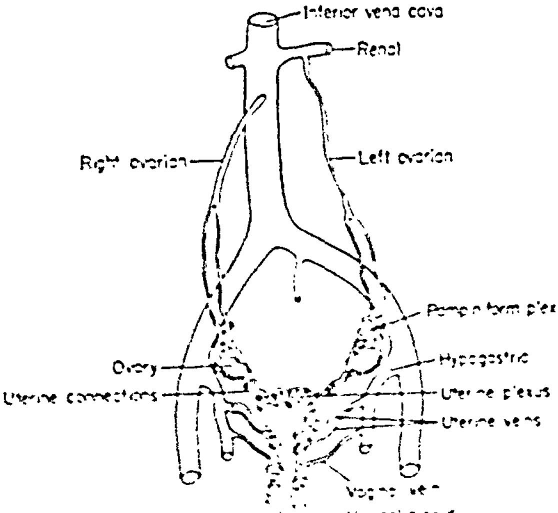


Fig. 1.—Diagram showing the chief branches of the venous tree. Parallel with the main inferior vena cava, superior vena cava stem. Four additional pathways extend along the long axis of the trunk. These are the epigastric-mammary, thoracic-epigastric, lumbar-hemiazygosazygos and the internal vertebral systems. The second and fourth systems are not shown in the diagram. *(Reproduced from Quiring's Collateral Circulation, Lea & Febiger, 1949, Fig. 40).*

cava rather than in the renal vein on the right side (Fig. 1). Furthermore, Batson[21] (1940) has demonstrated an elaborate system of vertebral veins possessing no valves but communicating with the renal, portal and peripheral circulations. I have been able to demonstrate widespread communications between the pelvic venous system and the visceral, lumbar, spermatic and lower limb venous components after injection of the dorsal vein of the penis.

By means of the aforementioned widespread venous communications, the left kidney is brought into intimate relation with the following structures: (1) the diaphragm, ribs, intercostal muscles, lungs, pleura and pericardium; (2) the renal capsule, perirenal fat and fascia, suprarenals, peritoneum; (3) the lumbar and dorso-axial muscles; (4) the vertebrae, spinal cord and meninges; (5) the pelvic viscera, musculature and bones; (6) the ureter and bladder; (7) the male and female genital organs; (8) the fascia and skin of the abdomen, back and perineum, and (9) the lower extremities.



It is readily apparent that any increase in intra-abdominal pressure, such as that caused by straining at stool or voiding, coughing, sneezing, etc., may dislodge tumor emboli from any one of the intrarenal or extrarenal venous components and produce a paradoxical venous tumor metastasis, i.e., by-passing the pulmonary, portal and caval venous circuits.

In the same manner, tumor emboli involving the left ovarian vein may extend by retrograde embolism to the pampiniform or ovarian plexuses or to the parametrial (uterine) or vaginal veins to reach any of the female pelvic organs or external genitalia (Fig. 2). In the male, tumor emboli from the renal vein may extend into the left spermatic vein and the pampiniform plexus of the spermatic cord and, by virtue of the communications with the pelvic venous system supplying the ureter, bladder, prostate, seminal vesicles, testes, spermatic cord, scrotum and scrotal skin, may subsequently involve any one or more of these organs.

It is difficult to attribute to mere chance or coincidence the fact that the left kidney was the site of the primary parenchymal neoplasm in 8 of 12 cases of ureteral metastases (site of primary neoplasm was not given in 3 cases), in each of 8 cases with vesical metastases, in each of 3 cases with penile metastases, in each of 2 cases with epididymal metastases, in 2 of the 3 cases with testicular metastases, and in 20 of 25 cases with vaginal metastases.

SUMMARY

Two proved cases of clear cell carcinoma of the kidney with metastases to the bladder are reported, and a brief discussion of the incidence and pathogenesis of this tumor is presented. Clinical, pathologic and anatomic evidence is offered in support of the author's contention that the

mechanism responsible for the development of secondary tumors in other parts of the genitourinary tract in cases of primary clear cell carcinoma or hypernephroma of the renal parenchyma is retrograde venous embolism rather than implantation of viable tumor cells excreted or expressed into the urine. There is no evidence to support the view that the incidence of ureteral and vesical metastases is greater in cases of clear cell carcinoma or in cases of hypernephroma with papilliferous or pseudopapilliferous histologic features.

ZUSAMMENFASSUNG

Es wird ueber zwei Faelle von Hypernephrom mit Metastasen in der Harnblase berichtet. Die Haeufigkeit des Vorkommens und die Pathogenese dieser Nierengeschwulst werden kurz eroertert. Der Verfasser belegt mit klinischen, pathologischen und anatomischen Unterlagen seine Ansicht, dass für die Entstehung sekundaerer von einem primaeren Hypernephrom oder parenchymalen Nierenkrebs ausgehender Geschwuelste in anderen Abschnitten des Harn-und Geschlechtsapparates ein retrograder venoeser Embolus eher verantwortlich zu machen ist als eine Implantation lebender Geschwulstzellen, die in den Harn ausgeschieden oder ausgepresst werden. Es gibt keine *stichhaltigen* Gruende anzunehmen, dass die Haeufigkeit von Hypernephrommetastasen in den Harnleitern und der Blase davon abhaengt, ob es sich histologisch um eine papillentragende oder eine pseudopapillaere Geschwulst handelt.

RIASSUNTO

Vengono riferiti tre casi di carcinoma del rene a cellule chiare con metastasi vescicali. Viene trattata la frequenza e la patogenesi di questo tumore, assieme alla sintomatologia e ai quadri anatomopatologici che giustificano la teoria dell'autore secondo la quale le metastasi dal rene ad altri punti del tratto urinario avvengono per via venosa retrograda piuttosto che per via urogena. Non vi sono dimostrazioni a sostegno di una maggior frequenza di metastasi ureterali o vesicicali nel tumore a cellule chiare piuttosto che nell' ipernefroma con aspetti papilliferi o pseudo papilliferi.

RÉSUMÉ

L'auteur présente deux cas vrais de cancer *"a clear cell"* du rein avec métastase à la vessie urinaire et il parle brièvement de la fréquence et la pathogénèse de cette tumeur. Il offre aussi des faits cliniques, pathologiques, et anatomiques dans son effort de démontrer que le méchanisme responsable pour le développement des tumeurs secondaires aux cancers du parenchyme du rein a *"clear-cell"* ou celui de l'hypernéphrome est plutôt une embolie veineuse rétrograde qu'une implantation de cellules cancereuses viables, excrétées ou pressées dans la vessie. Selon l'auteur, on ne peut pas, de ce que nous connaissons a présent, démontrer que la fréquence des métastases à l'uretère et à la vessie est plus *grande lorsq'il s'agit de cancer à "clear-cell"* ou lorsq'il s'agit des cas d'hypernéphrome characterisés histologiquement comme papillifères ou pseudopapillifères.

SUMÁRIO

São apresentados dois casos comprovados de carcinoma de celulas claras do rim, com metastases à bexiga, com uma breve discussção da incidencia e da patogenia deste tumor. São oferecidas indicações clinicas, patologicas e anatomias em apoio *da opinição do autor de que o mecanismo* respondavel pelo desenvolvimento de tumore secundarios em outras partes do tracto genitourinario em casos de carcinomas primario [illegible] lulas [illegible]s o

nefromas do parenquima renal é mais o embolia venosa retrograda do que a implantação de celulas tumorais viaveis excretadas ou lançadas na urina. Não há provas que apoiem o ponto de vista de que a incidencia de metastases ureterais e vesicais seja maior em casos de carcinoma de celulas claras ou em casos de hipernefroma com aspectos histologicos papiliferos ou pseudopapiliferos.

REFERENCES

1. (a) Pasteau, 1902; (b) Richards, 1905; (c) Cahn, 1911; (d) Pleschner, 1913; (e) Halber, 1920; (f) Dobrotworski. 1921, and (g) Thomson-Walker, 1925 cited by MacAlpine, J. B.: Brit. J. Surg. 31:164, 1948. (h) Hunt, V. C.: J. Urol. 18:225, 1927. (i) Schacht, F. W.: Surg., Gynec. & Obst. 53:102, 1931.

2. Bissell, 1914, cited by MacAlpine, J. B.: Brit. J. Surg. 31:164, 1948. Israel, J.: Chirurgisch klinik der nierenkrankheiten. Berlin: Verbrectung auf dem Harnwege, p. 451.

3. Seizo: Suzuki-Berlin klin. wchnschr. 46:294, 1909. Szymonowicz, J.: Polski Przegl. chir. 4:174, 1932; Ztsch. f. urol. 35:422; also cited by MacAlpine. J. B.: Brit. J. Surg. 31:164, 1948. Cibert, J., and Perrin, J.: Lyon Med. 162:198, 1938. Rupel, E., and Sutton, W. E.: J. Urol. 63:487, 1950. Scott, W. W.: Year Book of Urology. Chicago: Year Book Publishers, 1952. p. 101. Heslin, J. E., Milner, W. A., and Garlick. W. B.: J. Urol. 73:39, 1955.

4. Hoffman, E.: Deutsch med. wchnschr. 33:303, 1907 (case No. 2).

5. (a) Kaplan. J. H.; MacDonald, J. R., and Thompson, G. J.: J. Urol. 66:792, 1951. (b) Kimball, F. N., and Ferris, H. W.: J. Urol. 31:257, 1934.

6. Albarran, J., and Imbert, L.: Les Tumeurs du Rein. Paris: Masson et Cie, 1905, p. 122. Kimball and Ferris,[5b] Melicow, MacAlpine, J. B.: Brit. J. Surg. 34:164, 1948.

7. Lattes, cited by Melicow.

8. Abeshouse, B. S.: Primary Tumors of the Ureter, Am. J. Surg., to be published.

9. McCrea, L. E., and Peale, A. R.: Urol. & Cutan. Rev. 55:11, 1951.

10. Watson, F. S., and Cunningham, J. H.: Diseases and Surgery of Genito-Urinary System. Philadelphia: Lea & Febiger, 1908.

11. Klinger, M. E.: J. Urol. 65:144, 1951.

12. Kretschmer, H. H.: J. Urol. 40:421, 1938.

13. Kaminsky, A. F.: J. Urol. 61:997, 1949.

14. Schulte, T. L., and Priestley, J. T.: Proc. Staff Meet. Mayo Clin. 16:381, 1941. Rappoport, A. E.; Nixon, C. E., and Salmieri, E. J.: Am. J. Clin. Path. 16:341, 1946. Miller, H. L.: Urol. & Cutan. Rev. 54:401, 1950. Goldberg, L., and Khayat, E.: New York J. Med. 52:1547, 1952.

15. Goldstein, A. E., and Rubin, S. W.: Bull. M. School, Univ. of Maryland 32:140, 1948.

16. Boger, A.: Beitrag. z. path. Anat. u.z. allg. path. 80:640, 1928.

17. Hovnanian, M. S.: J. Urol. 64:188, 1950.

18. Willis, R. A.: The Spread of Tumors in the Human Body. London: J. A. Churchill Co., 1934.

19. Martzloff, K. H., and Manlove, C. H.: Surg., Gynec. & Obst. 88:145, 1949.

20. Anson, B. J.; Cauldwel, E. W.; Pick, J. W., and Beaton, L. E.: Surg., Gynec. & Obst. 84:313, 1947; J. Urol. 60:714, 1948.

21. Batson, O. V.: Ann. Surg. 112:138, 1940.

ADDITIONAL SOURCES

Howell, R. D.; Hendricks, J. W., and Mertz, H. O.: J. Urol. 46:1103, 1941.

Kasten, H. E.: J. Urol. 42:92, 1939.

Parker, A. E.: J. Urol. 43:811, 1940.

Quiring, D. P.: Collateral Circulation. Philadelphia: Lea & Febiger, 1949, Figs. 40 & 45.

Uhler, K.: Cas op. Lek. cesk. 90:648, 1951.

Editorial

Advantages of One-Stage Resection of Esophageal Diverticula

EITHER esophageal diverticula are more common than they formerly were, or more of them are discovered in the course of routine roentgen studies of the esophagus.

Many small diverticula give only occasional trouble, but as they increase in size they cause increasing difficulty in swallowing, and regurgitation of food occurs.

In the presence of a well developed diverticulum of the esophagus there is some difference of opinion as to the proper manner of dealing with the defect.

Primary resection in one stage, with immediate closure of the esophageal opening, is certainly the most desirable treatment. There are, however, several details in the technic that may greatly facilitate a smooth, uncomplicated recovery. Reviewing the literature, I am amazed at the great variation in methods of dealing with these rather uniform conditions.

In selecting diverticula for one-stage resection, one must be sure that the rules pertaining to this type of operation are not violated. No patient in whom the sac is the seat of recent inflammatory change should be accepted for single-stage resection. A patient who has recently undergone endoscopic study presents a hazard. I have had occasion to operate on a very sick patient with a diverticulum that had been perforated accidentally during esophagoscopic examination. The accident was not immediately recognized, and leakage of the contents of the sac into the mediastinum set up a distressing series of complications. Mediastinitis developed, and, a little later, purulent pleuritis. Exposure of the perforated diverticulum and its anchorage in the upper angle of the wound was followed by rapid improvement of the mediastinitis and pleuritis. Obviously, one would not venture upon resection with such a patient.

If conditions warrant a single-stage diverticulectomy, I have found the following technic practically free of annoying complications:

1. The incision, 2½ or 3 inches (6.3 to 7.5 cm.) long, centered at the lower margin of the cricoid cartilage, is made along the anterior border of the sternomastoid muscle on the side of presentation of the diverticulum.

2. The cervical fascia is opened along the anterior border of the sternomastoid muscle, after which the muscle is retracted laterally to expose the carotid sheath. It is usually possible to retract the omohyoid muscle medially without division.

3. The carotid sheath is freed, and the lateral margin of the thyroid gland is exposed by division of the sternothyroid musculofascial layer. This permits lateral retraction of the contents of the carotid sheath with a ribbon retractor and medial retraction of the thyroid, larynx and trachea.

4. The loose areolar tissue between the thyroid and the carotid sheath is then opened with a Kocher dissector, which is an ideal instrument for this and other steps involving blunt dissection in the neck. The inferior thyroid artery is encountered at this point; this vessel is

---

From an address delivered at the Twentieth Annual Congress of the United States and Canadian Sections, International College of Surgeons, Philadelphia, Sept. 6-10, 1955

Submitted for publication Sept. 30, 1955.

ligated and divided if it interferes with exposure.

5. If the lateral margin of the esophagus is now visible, the position of the diverticulum can be established by recalling that its neck is at the level of the cricoid cartilage, whereas the sac extends downward between the posterior wall of the esophagus and the prevertebral fascia.

6. Gentle traction on the diverticulum with nontraumatizing forceps will deliver the sac into the wound for inspection and appraisal.

7. When the neck of the diverticulum has been exposed, gentle traction and lifting will make it possible to rotate the pharyngo-esophageal junction and bring it into view. Rotation of the trachea and esophagus in their longitudinal axes affords better visualization of the proximal edge and does not endanger the recurrent laryngeal nerves.

8. The muscle fibers are swept away from the neck of the sac in a manner to preserve as many fibers as possible for the ensuing repair. In defects superior to the cricopharyngeus portion of the inferior constrictor muscle, the fibers below the neck of the sac form a heavy transverse band, which is not present in diverticula originating below the cricopharyngeus.

9. After careful delineation of the neck of the diverticulum, fine forceps are applied transversely at the lateral margin of the juncture of the pharynx or esophagus and the diverticulum. A knife is used to divide the tissue proximal to the forceps. This initial opening through the esophageal mucosa and submucosa is closed with one or more interrupted fine silk sutures.

10. A second pair of forceps is applied just beyond the first, care being taken to keep in the same transverse plane and to follow the normal convexity of the posterior esophageal wall.

11. As further forceps are applied subsequently and the tissue is divided proximal to them, the opening in the esophagus is closed by carefully spaced through-and-through interrupted sutures until the entire diverticulum has been removed.

This methodical clamping, incision and suturing result in secure closure of the defect without constriction of the lumen. No devitalized or crushed tissue is left in the suture line. The mucosal edges are well apposed, and the submucosal layer is held under even tension. The importance of suturing fresh, viable tissues that have not been injured or impaired by clamps, escharotics or cautery is strongly emphasized. It is likewise important to avoid the use of continuous or purse-string sutures, because they have a tendency to narrow the lumen of the esophagus.

12. The muscle fibers of the cricopharyngeus and the uppermost fibers of the esophagus are closed over the first suture line with interrupted silk sutures.

13. A small, soft rubber drain may be brought out from the lateral margin of the thyroid gland to provide a pathway of escape for blood or serum, as well as for any leakage that may occur. The drain must not be left adjacent to the suture line in this or any closure or anastomosis of the alimentary tract. The drain would inhibit reparative processes by carrying the normal plastic exudate away from the suture line.

In this procedure one can visualize the danger of injury to the recurrent laryngeal nerve if one fails to recognize its proximity to the lateral margins of the diverticulum. When the sutures are placed transversely across the neck of the sac there is little tendency to the formation of stricture at this level. I have had no occasion to use esophageal bougies to dilate the esophagus after operation.

There are some points in the operation suggested here that, in my opinion, should be emphasized. In closing the neck of the sac, the sutures must carefully approximate the mucosal layers without tension. The use of fine interrupted silk sutures, which are evenly spaced and the knots tied with ends within the esophagus, is satisfactory. The constrictor muscles and the longitudinal muscles of the esophagus should be deployed over the closed defect in a manner to aid in the closure. It may be an unnecessary refinement, but I prefer to divide the neck of the sac with a very sharp knife rather than with scissors. In no instance are the edges of the defect crushed, cauterized or unnecessarily traumatized. One layer of evenly spaced interrupted sutures is sufficient for adequate closure of the neck of the diverticulum.

When the operation is near completion it may be judicious to place a small rubber wick in the lower skin angle, but one should never place a gauze wick in the vicinity of the sutures in the esophagus, because its presence would tend to remove the exudate that is essential in the healing process at the closure site.

I like to introduce a fine indwelling Levine tube before the operation and leave it in place for several days. If difficulty is encountered in passing this tube preoperatively, one should not persist, for fear of perforating the diverticulum. It is much safer and easier to direct it into the distal portion of the esophagus during the operation.

Intratracheal anesthesia is the form I usually employ.

The technic is not difficult if one takes advantage of the mobility of the esophagus. If the patient was greatly depleted before the operation, the indwelling nasal catheter may be used to introduce liquid nourishment by the continuous drop method. When the patient objects to the indwelling tube it may be removed, but feeding should not be indulged in until after the seventh day, and even then only small amounts of liquid are given at hourly intervals for several days. Succumbing to the entreaties of the patient for early feeding is the greatest hazard to the security of the esophageal repair.

RAYMOND W. MCNEALY,
F.A.C.S., F.I.C.S., Chicago, Illinois

The world turns aside to let any man pass who knows whither he is going.

—*Jordan*

Though ambition itself be a vice, it is often the cause of great virtue. Give me that wit whom praise excites, glory puts on, or disgrace grieves; he is to be nourished with ambition, pricked forward with honour, checked with reprehension, and never to be suspected of sloth.

—*Jonson*

The mind celebrates a little triumph whenever it can formulate a truth.

—*Santayana*

New Books

Books Received.—The following books have been received by the Editor; they will be reviewed critically as space and facilities permit. Omission of more extended review, however, is not to be taken as criticism of the merit of the book.

J.A.M.A. Clinical Abstracts of Diagnosis and Treatment. Selected by Noah J. Fabricant. New York and London: Grune, Stratton, Inc., 1955. Pp. 627 including index.

Operative Technics in General Surgery. Edited by Warren H. Cole, with an introduction by Frank H. Lahey. Thirty-seven contributors. New York: Appleton—Century-Crofts, Inc., 1955. 2d ed. Pp. 973, with 524 illustrations and 2 color plates. Reviewed in this issue.

Cardiovascular Surgery. Henry Ford Hospital International Symposium. Edited by Conrad R. Lam. Philadelphia and London: The W. B. Saunders Company, 1955. Pp. 542.

Chirurgie du Corps Thyroide. By Sylvain Blondin. Paris: G. Masson et cie, 1955. Pp. 292, with 37 illustrations.

Applied Medical Bibliography for Students. By William Dosite Postell. American Lecture Series No. 259. Springfield, Ill.: Charles C Thomas, Publisher, 1955. Pp. 142.

Ophthalmology. Edited by Paul C. Craig. Fort Pierce Beach, Florida: The Froben Press, 1955. Published as a memorial to the late Dr. Otis R. Wolfe.

Peripheral Nerve Injuries. Edited by H. J. Seddon. Medical Research Council Special Report, Series No. 282. London: Her Majesty's Stationery Office, 1954. Pp. 451, with 276 illustrations.

New Concepts in Surgery of the Vascular System. By Emile Holman. Springfield, Ill.: Charles C Thomas, Publisher, 1955. Reviewed in this issue.

Textbook of Endocrinology. Edited by Robert H. Williams. Philadelphia: The W. B. Saunders Company, 1955. 2d ed. Pp. 776, with 173 illustrations.

Intracranial Gliomata. By John Penman and Marion C. Smith. Medical Research Council Special Report Series No. 284. London: Her Majesty's Stationery Office, 1954. Pp. 70, with 56 tables. Reviewed in this issue.

El Dranaje en Cirugía. Por Domingo Prat. Montevideo, Imprenta Rosgal, 1954. Pp. 166. Illus.

Atlas of Rush Pin Technics. By Leslie V. Rush. Meridian, Miss.: The Berivon Company, 1955. Pp. 227. Reviewed in this issue.

La Valvola Mitrale: Aspetti anatomici, fisiologici, clinici e chirurgici. Per Michele A. Chiechi e Charles P. Bailey. Rome, Pensiero Scientifico, 1954. Pp. 561. Illustrated.

Sindromi Dolorse dopo Interventi Gastrici e loro Terapia Chirurgica. Per Luigi Leopoldo Bracca. Torino, Minerva Medica, 1952. Pp. 178. Plates.

Praktische Anatomie. By T. von Lanz W. Wachsnuth. Berlin: Springer, 1954. Pp. 549, with 321 illustrations. Reviewed in this issue.

Physiology and Anatomy. By Esther M. Greisheimer. Philadelphia: The J. P. Lippincott Company, 1955. 2d ed. Pp. 868, with 430 illustrations, 48 in color.

The Back and Its Syndromes, Including Injuries, Diseases, Deformities and Disabilities. By Philip Lewin. Philadelphia: Lea & Febiger, 1966. Pp. 942, with 371 illustrations.

The Shoulder and Environs. By James E. Bateman. St. Louis: The C. V. Mosby Company, 1955. Pp. 565, with 376 illustrations.

BOOKS REVIEWED

Operative Technics in General Surgery. Edited by Warren H. Cole, with an introduction by Frank H. Lahey. New York: Appleton—Century-Crofts, Inc., 1955. 2d ed. Pp. 973, with 524 illustrations and 2 color plates.

The second edition of Dr. Warren H. Cole's *Operative Technics in General Surgery* more than meets all expectations as to soundness of content and brilliance of presentation. Its twenty-six chapters are the work of thirty-seven contributors, each a surgeon of high distinction in his particular field. The late Dr. Frank H. Lahey, who contributed the introduction, commented aptly on this galaxy of surgical talent: "The names of these various authors appear frequently in the world literature . . . They are still young enough to be flexible in their viewpoint . . . they are, however, sufficiently mature to have had time and opportunity to acquire a volume of experience which makes them capable of presenting their subject with authority."

The titles of the successive chapters are as follows: *Wound Healing and the Care of Wounds; Hemorrhage and Shock; Blood Transfusions and Allied Problems; Burns; Preoperative and Postoperative Care; Amputations; The Esophagus; Abdominal Incisions; Surgery of the Stomach and Duodenum; Gastric Vagotomy in the Treatment of Peptic Ulcer; Surgery of the Small Intestine; Gastrointestinal Surgery in Infancy and Childhood; The Pancreas and the Adrenals; The Gallbladder and Bile Ducts; The Liver and Subphrenic Space; The Colon; The Appendix; The Lower Part of the Sigmoid; the Rectum and Anus: The Lymphatic System; The Spleen; Abdominal Hernia; The Breast; The Thyroid and Parathyroid Glands; The Muscles, Fasciae, Tendons and Bursae; Surgery of the Hand and Its Tendons,* and *The Skin and Subcutaneous Tissue.* The list of titles itself indicates Dr. Cole's success in gathering material suitable to his principal intention, which, to quote from his preface, was to assemble material on "subjects more strictly in the realm and of interest to the general surgeon but which will be valuable to the young surgeon training in the various specialties of surgery." Three entirely new chapters are included: those on blood transfusion, gastrointestinal surgery in infancy and childhood and the appendix.

As Dr. Lahey has pointed out, the immense value of this work lies in its comprehensiveness, its thoroughness, its advanced outlook and the fact that the various subjects are dealt with by men who have had an abundance of personal experience therein. "My own long and rather large experience," he said, "has taught me that . . . it is impossible for a surgeon to attain great technical skill in any given operative procedure except by a special interest in the procedure and by performing it again and again."

The arrangement of the book is admirable; there is no attempt to equalize the length of the various chapters, and each subject, therefore, determines the amount of material presented. This is as it should be; it achieves a natural and logical rather than an artificial balance, and the reader is spared the irritation of "padding."

The writing and the illustrations, on the whole, are excellent. Each chapter is abundantly documented with references to the literature, and a comprehensive index is appended. The work is a necessary part of the library of every general surgeon and should be made available to students and young surgeons everywhere. Nor will the specialist find it wanting in either enjoyment or value, for there are innumerable areas of surgical knowledge which, although studied in most intricate detail by the general surgeon, are fundamental to the building up of skill in a specialized area. In an age of specialization carried, in some instances, to unnecessary extremes, it is well for all surgeons to keep these basic principles in mind. By its very nature, the new edition of Dr. Cole's superb compendium will contribute significantly as a counterbalance to overspecialization.

M. T.

New Concepts in Surgery of the Vascular System. By Emile Holman. Springfield, Ill.: Charles C Thomas, Publisher, 1955.

This excellent little monograph by a well known surgeon and research worker is a pleasure to read. It consists of two parts; the first is a lecture honoring Dr. David W. Yandell of Louisville, Kentucky, and the second is a lecture honoring Dr. Arthur Dean Bevan of Chicago.

The first part, entitled "The Immediate and Late Treatment of Arterial Injuries", summarizes the changes in s [illegible] h. [illegible] of vascular injuries. Dr. Holman describes the success of arterial repairs as due to antibiotics, to special vascular instruments, such as Pott's clamps, to the rapid return of injured persons to places where definitive operations can be done, and finally to the development of grafting procedures. He also describes the treatment for arteriovenous fistulas, in which it is obvious that he has had much experience.

The second part of this monograph is entitled "The Pathologic Physiology of Poststenotic Dilatation: Its Significance in the Development of Arterial Aneurysms." To those of us who have heard Dr. Holman present this material in lecture form it is a joy to read it in book form. His material will probably be a classic of our times. His research is a model for other investigators.

By his simplification of the problems in the experimental laboratory Dr. Holman has demonstrated that relentless pressures eventually cause dilatation and aneurysm by structural fatigue. The relentless pressure is due to the intermittent jets due to systole and to turbulence of flow beyond the stenotic area. These phenomena, previously thought to be due to nervous or sympathetic imbalance, are demonstrated by Dr. Holman to be due to purely physical laws and are present in the poststenotic dilatation of coarctation of the aorta, as well as in poststenotic dilatation of the peripheral arteries.

This is a classic piece of work. It should be not only read but studied by all those interested in vascular fluid phenomena.

HERBERT D. TRACE, M.D.

Intracranial Gliomata. By John Penman and Marion C. Smith. Medical Research Council Special Report Series No. 284. London: Her Majesty's Stationery Office, 1954. Pp. 70, with 56 tables.

This short monograph is a detailed statistical analysis of 298 cases of histologically proved intracranial gliomas. These are divided into five pathologic groups, viz., glioblastomas, 163 patients: astrocytomas, 99 patients: oliodendrogliomas, 14 patients; medulloblastomas, 20 patients, and ependymomas, 2 patients. The records of these patients were taken from the neurosourgical records of St. George's Hospital for the ten-year period from August 1937 to August 1947, and the minimum period of follow-up for patients who survived for this period was twenty-four months.

It is of considerable interest that three-fifths of the skull films were considered abnormal. It appears that the value of roentgenograms of the skull is overshadowed by other diagnostic procedures, especially ventriculographic study. It must be remembered that taking roentgenograms of the skull is not painful or dangerous, something that cannot be said for the more informative ventriculographic or angiographic studies. The authors recognize the fact that the whole duration of the illness, or the survival period from the onset of the illness, is more significant than the survival period after admission to the hospital. Of 85 patients who survived more than twelve months after treatment, 52 were considered to have had a useful or worthwhile survival period. These patients represented 10 per cent of the glioblastomas, 34 per cent of the astrocytomas, 21 per cent of the oligodendrogliomas and 5 per cent of the medulloblastomas.

The authors conclude that the three most important factors in determining length of survival with intracranial glioma are the age of the patient, the site of the tumor and the pathologic type. Youth and long survival were strongly associated.

In adults the cerebral hemispheres are more favorable to long survival than the cerebellum; in children the reverse is true. The results of irradiation could not be assessed for lack of controls, and a controlled clinical trial of irradiation is suggested. As the authors state, 296 seems a large number of cases, but subdivision according to age of patient, pathologic picture, site of tumor and type of treatment soon brings the individual groups down to a size expressed by single figures. This is a valuable monograph, nevertheless, that should be carefully studied by everyone interested in intracranial gliomas.

HAROLD C. VORIS, M.D.

Atlas of Rush Pin Technics. By Leslie V. Rush. Meridian, Mississippi: The Berivon Company, 1955. Pp. 227.

The material presented here deals in its entirety with a system of treatment of fractures of the long bones, utilizing the intramedullary pin designed by Dr. Leslie Rush. An adequate basis for evaluation of this technic is provided by a large group of patients (approximately 700) treated at the author's hospital.

As the author himself points out, the presentation of material is unorthodox. There is no index and no bibliography. The text is divided into three sections: Part 1 is concerned with general considerations, the technic of insertion of the pin. The indications for its use, the dynamic factors involved, and methods of reducing the fractures and achieving stability of fixation. Part 2 deals with the lower extremity and Part 3 with the upper extremity. Specific cases of fracture, ranging from rather simple to extremely difficult types are described in detail and illustrated with roentgenograms.

The text is also profusely illustrated with diagrams and line drawings. These are clear and accurate and are extremely helpful in clarifying pertinent points and refinements of technic. Certainly the manner of presentation enables the reader to understand and absorb the subject quickly and easily. Unfortunately, as is usually true of diagrammatic presentations, the treatment of the more difficult fractures may appear not at all difficult to the uninitiated eye. In addition, partly because of the profuse illustrations and partly because of the unorthodox method of presentation, there is an occasional loss of continuity of thought. These minor objections detract but little from the obvious value of the book, which presents in lucid detail a thoroughly tested method of intramedullary fixation. Certainly both the book and its subject, the Rush pin, can be highly recommended for detailed study by all who are called upon to treat fractures frequently.

ALLAN B. HIRSCHTICK, M.D.

Praktische Anatomie. By T. von Lanz W. Wachsmuth. Berlin: Springer, 1954. Vol. 1. Pp. 549, with 321 illustrations.

This volume of *Praktische Anatomie* deals with the neck. It is an excellent atlas which results from much planning, assembling of material and collaboration between artist and authors. Throughout this work one is impressed with the tridimensional presentation of the illustrations; particularly outstanding are those appearing on page 188.

This reviewer would take issue with a point in respect to the middle layer of deep cervical fascia as related to the thyroid gland. The material herein presented fails to emphasize the important practical point that this layer of fascia is attached to the lateral aspect of each thyroid lobe. This criticism is mentioned with no intent to detract from the praise due to this worthy tome.

Rarely will one see such masterful reproductions. The work can be recommended unreservedly to anyone interested in the subject of anatomy, applied or otherwise. It is unfortunate that more books do not attain to these standards.

PHILIP THOREK, M.D.

Histologische Geschulstdiagnostik: Systematische Morphologie der menschlichen Geschwulste als Grundage fur die klinische Beartellung (Histologic Diagnosis of Tumors: Systematic Morphologic Studies of Tumors in Man as a Basis for Clinical Judgment). By A. von Albertini. Stuttgart: Georg Thieme Verlag, 1955. Pp. 544, with 638 illustrations.

This book is divided into two parts. Part 1 is a consideration of the general and special histogenesis of tumors, including their general morphologic aspects and the terms used to describe them. Part 2 deals with the diagnosis of tumors according to anatomic location.

One can only admire the author's thorough knowledge of the material presented and of the literature cited. Dr. Albertini, who certainly is an authority on the pathologic nature of tumors, leans backward to do justice to the opinions of pathologists that differ from his own.

Most readers will readily admit that this is one of the most beautifully written and fascinating books available on tumor pathology. One may differ with the author on certain subjects, but in general all controversial topics are masterfully handled. The book can easily be read even by one who does not know the German language perfectly. All in all, it belongs on the same level as did the famous earlier work of Ewing.

JEROME J. MOSES, M.D.

Abstracts from Current Literature

The By-Pass Operation in the Treatment of Arteriosclerotic Occlusive Disease of the Lower Extremities. Crawford, E. S., and DeBakey, M. E., Surg., Gynec. & Obst. 101:529, 1955.

During the past few years, surgical approach to arteriosclerotic segmental occlusive disease of the peripheral arteries has been directed toward reestablishment of blood flow through the main arterial channels by endarterectomy, excision and graft replacement of the occluded segment and by-pass of the diseased area with a graft. Important factors concerned are: first, the presence of an adequate patent peripheral arterial bed for the ready and unimpeded outflow of blood, and second, the performance of the procedure in a manner that will minimize tissue damage and interference with the collateral circulation. Arteriographic studies show not only the limits of the occlusive process but the character of the peripheral arterial bed. The procedure should be directed toward restoration of a strong pulsatile blood flow into the peripheral arterial bed, yet its performance should be associated with minimal jeopardy to the existing circulatory and functional capacity of the extremity to prevent edema, neuralgia and wound infection or subsequent thrombosis. Endarterectomy, except for very short occlusive lesions, too frequently lead to postoperative thrombosis. Complete excision with homograft replacement of an occluded segment is an extensive procedure, with increased likelihood of injury to nerves, lymphatics and adjacent veins. The type of by-pass operation generally employed may destroy collateral vessels.

To avoid this disadvantage and to obviate complete loss of circulation by thrombosis subsequent to endarterectomy or excision with homograft, the authors use the by-passing operation originally described by Kunlin and his associates, by anastomosing a graft into the side of the host artery above and below the diseased segment, through two small separate incisions connected by a tunnel made by blunt dissection or with a vein stripper. A detailed account of their technic with illustrations follows. They then report that blood flow through the main arterial channel distal to an occlusion was successfully reestablished in 37 of 40 extremities so treated. Success was determined arteriographically or by the presence of palpable pulses distal to the block that were absent prior to operation. The 3 failures occurred with borderline candidates as was indicated by small distal patent segments with secondary occlusions below. None of the patients was made worse by the operation.

The indication for surgical intervention in the 37 successful cases was intermittent claudication in 29; gangrene of limited degree in 7 and extensive gangrene in 1. Among the patients with gangrene, painful ischemic ulcers were present in 2 and severe rest pain in 6, and in 1 a digit had been destroyed by associated infection. The maximum period of observation was eighteen months. At the time of writing there had been no recurrence of difficulty. No deaths occurred and complications included a superficial wound infection in 1 patient and, thrombophlebitis, complicated by a small pulmonary infarct, in another. Reconstituted lyophilized arterial homografts with the ends slightly beveled were used as grafts.

WARREN A. YEMM, M.D.

Late Results Following Endarterectomy. Barker, W. F., and Cannon, J. A., Surg., Obst. & Gynec. 63:562, 1955.

The authors report experience with endarterectomy in 17 patients two years ago. Since that time they have done 42 operations on 41 patients and conclude that they are selecting their patients more carefully through an increase in their ability to predict which patients will be decidedly improved. They select the candidate on the basis of clinical signs of arterial insufficiency and pulse deficit in patients whose condition has been evaluated on the basis of angiograms and on the status of their cerebral, coronary and renal circulation. Patients in whom the upper level of the block is above the popliteal artery are subjected to exploration of that artery (or exploration at the level of the bottom of the "obstruction" if this has been seen on a preoperative film). Success is estimated at that time on the extent of intimal thickening in the vessel exposed, the patency of the distal arterial tree as demonstrated angiographically and the diameter of the vessel.

The operative technic consists of appropriate exposure of the upper and lower levels of the atherosclerotic obstruction, with excision of the diseased intima and its contained secondary clot by means of dissection in a plane in the innermost layers of the media, with repair of the artery as a tube of raw media. A smooth transition from the endarterectomized vessel to the normal artery and the use of heparin, together with the rapidity of blood flow, indicates the maintenance of a patent lumen.

In 27 of the 42 cases the results were favorable. Twenty-five of the 27 were excellent, with relief of symptoms of arterial insufficiency and return to pulses beyond the endarterectomized segment. The 2 failures, in the authors' opinion, could have been avoided by performing a more extensive endarterectomy at the time of the original operation. Follow-up investigation (for two years or more) of the 5 patients who originally obtained good results indicates that all of these have maintained the improvement present immediately after operation. One has been observed for thirty-eight months.

Complications encountered included significant bleeding in 5 cases, in 2 of which reexploration was required. Deep venous thrombosis occurred in 3 instances with no pulmonary emboli being recognized. Two patients had significant wound infections. In a third patient, homologous serum jaundice developed with separation of the skin edges. This patient was 1 of those with venous thrombosis. One instance of aneurysmal dilatation of the femoral artery has been observed, and in another case the patient had myocardial infarction three months after a satisfactory endarterectomy.

There have been no deaths in the series. Poor results are certain to follow generalized arteriosclerosis, diffuse distal arteriosclerosis and a thick intimal flap at the distal end of dissection. The onset of claudication and identification of a pulse deficit should be taken to indicate prompt arteriographic study.

WARREN A. YEMM, M.D.

Lithopedion. Nesbitt, R. E. L. Jr., U. S. Armed Forces M. J. 6:903, 1955.

In certain lower animals lithopedion formation *in utero* is relatively common, the fetus being retained in the uterus for a long time, with subsequent deposition of lime salts. It is generally conceded, however, that lithopedion formation in man is confined to extrauterine pregnancies in which part or all of the products of conception are extruded or initially implanted into the abdominal cavity, where calcification takes place.

The case of lithopedion reported in this article brings the total of authentic reported cases in the world's literature to 258. The lithopedion developed over an eleven-year period. The initial attack of acute abdominal pain was undoubtedly due to the rupture of an extrauterine pregnancy, with extrusion of the unattached fetus into the abdominal cavity, where it later became calcified. The subsequent periodic symptoms were due to recurrent attacks of pelvic inflammatory disease secondary to the initial process. Menstrual disturbances were secondary to functional cysts of the ovaries and to infection.

EDMUND LISSACK, M.D.

An Appraisal of Radical Pancreatoduodenectomy in the Treatment of Malignant Diseases. Gronqvist, Y. K. G., Ann. Chir. et Gynaec. Fenniae 44:120, 1955.

The author of this paper tries to estimate the value of radical pancreatoduodenectomy as an operation for cancer and concludes that the operation described by Waugh and Clagett in 1946 most nearly fulfills the principles to be considered in the choice of operations. From the anatomic standpoint, he points out, the close proximity of major blood vessels and the location of many regional lymph nodes in inaccessible areas make it very difficult to do an adequate cancer operation on the head of the pancreas. From the standpoint of pathology, he cites the studies of Miller and others, as well as statistics by Catell and by McDermott and Bartlett. From the standpoint of operability and resectability the author is apparently considerably discouraged and from the standpoint of the postoperative mortality rate, as cited by several published series, expresses the opinion about 10 per cent would be the expected figure.

The difference between lesions of the ampulla of Vater and head of the pancreas is once again brought out. With regard to postoperative morbidity, Gronqvist draws the conclusion that if the pancreatic juice from the remaining portion of pancreas is led into the intestines by some type of anastomosis and that if the patient has had a diet high in calories, protein and carbohydrates and [illegible]w in fat, supplemented by admi[illegible]ion [illegible]ncreatin, there is relief of [illegible]t, [illegible] impairment of internal [illegible].

creas. To follow up the results, he notes the data reported in various series, including that of McDermott and Bartlett, who compared 112 cases of carcinoma of the head of the pancreas observed during the period of 1931 to 1940 and 136 cases from 1941 to 1951, when resection for cure was in vogue. The percentage of survival by three month periods was calculated for all patients who left the hospital alive.

If one compares these percentage survival cures, it is apparent that, up to twenty-seven months, the curves are nearly identical. Beyond this point, all patients whose cancers had not been resected were dead, whereas 2 who underwent pancreatoduodenectomy were still alive.

The author concludes that, with this perspective for pancreatoduodenectomy in the treatment of cancer of the head of the pancreas, it is fair to say that 2 patients out of the entire group were benefited by resection. Discussing the follow-up results with regard to carcinoma of the ampulla of Vater, he cites the statement of McDermott and Bartlett that the average survival of patients with carcinoma of the ampulla has not been altered appreciably by the introduction of radical pancreatoduodenectomy. He cites also the astounding results reported by Cattell who has 15 patients still living and has reported that none in his series who survived four and one-half years or more had demonstrable metastases to the lymph nodes. Follow-up results on carcinoma of the common bile duct indicate a more favorable prognosis, as does also, probably, carcinoma of the second portion of the duodenum. In the author's opinion the literature tends to show that resection as compared with diversion of the biliary tract, is the superior palliative procedure for resectable lesions.

From all this he concludes that radical pancreatoduodenectomy in its present form is inadequate in the treatment of carcinoma of the head of the pancreas and should be modified or discarded. In his opinion, total pancreatectomy as advocated by Brunschwig offers an approach to the problem. Any resection for cancer that leaves behind the main venous and lymphatic channels draining the anatomic site of the origin of the cancer (In this case, the portal vein and its tributaries, and the lymphatics of the gastrohepatic ligament) will obviously fail except in a few cases. Further time will be necessary for evaluation of the operative procedure of Child and McDermott, which includes resection of the portal vein and the accompanying lymphatic system.

WARREN A. YEMM, M.D.

Twin Pregnancy and Delivery. Kurtz, G. R., Keating, W. J., and Loftus, J. B., Surg., Gynec. & Obst. 6:370, 1955.

This study was undertaken principally in an effort to probe into causes of the fetal wastage which so prominently characterizes twin pregnancy and delivery, and to elucidate the relation of certain controllable factors in twin delivery to twin survival.

With regard to operative deliveries, it was deemed advisable to ascertain the influence of the obstetrician on the outcome.

In this series of 500 consecutive twin pregnancies and deliveries it was observed that the main causes of fetal wastage in twin deliveries is prematurity and/or immaturity and increased liability of the premature twin to birth trauma and anoxia.

The birth hazard for the second twin is considered higher than that for the first twin.

There is no appreciable difference in weight between the twins.

Results may be improved by: (a) early diagnosis and better prenatal care; (b) elimination of unnecessary operative intervention and (c) reduction of the interval between delivery of the twins, particularly when small babies are involved.

The incidence of preeclampsia, hydramnios, and prolapsed cord is considerably greater than in single births. That of postpartum hemorrhage, however, is not necessarily greater.

There were no maternal deaths in this series.

EDMUND LISSACK, M.D.

◆

A bill is the most extraordinary locomotive engine that the genius of man ever produced. It would keep on running, during the longest lifetime, without ever once stopping of its own accord.

—*Dickens*

The Journal of the International College of Surgeons

ORTHOPEDIC SURGERY

Condylectomy for Metatarsalgia: Indications and Results 220
Harvey E. Billig Jr., M.D., F.I.C.S., Los Angeles, California

PLASTIC AND RECONSTRUCTIVE SURGERY

Homogenous Knee Meniscus in Otoplasty 227
Thomas Ray Broadbent, M.D., F.A.C.S., F.I.C.S., Salt Lake City, Utah

PROCTOLOGIC SURGERY

Amputation Neuroma of the Anus 239
Mark M. Marks, M.D., F.I.C.S., Kansas City, Missouri

THORACIC SURGERY

Pedunculated Fibroma and Leiomyoma of the Lung 241
Nihad Dorken, M.D., F.I.C.S., Istanbul, Turkey

EDITORIAL

John Arderne, Father of English Surgery 247
Gerald N. Weiss, M.D., F.A.C.S., F.I.C.S., Lake Charles, Louisiana

NEW BOOKS 262

ABSTRACTS FROM CURRENT LITERATURE 267

ARTICLES TO BE PUBLISHED

Artificial Hibernation
Carlos Gama, M.D., F.I.C.S., and Flavio Syles, M.D., Sao Paulo, Brazil

Periodic Paralysis Associated with Graves' Disease: Studies of Three Cases
Shiro Hayashi, M.D., Tokyo, Japan

Management and Treatment of Post-Traumatic and Postoperative Spastic Paralysis
Temple Fay, M.D., F.A.C.S., F.I.C.S., Philadelphia, Pennsylvania

Cardiac Arrest in Cases of Coronary Occlusion
Attilio Celio, M.D., Basel, Switzerland

The Journal of the International College of Surgeons
FOUNDED IN GENEVA, SWITZERLAND, 1935 - INCORPORATED IN WASHINGTON, D. C., 1940
Vol. XXV FEBRUARY, 1956 No. 2

Abdominal and General Surgery

The Value of the Scout Film in Diagnosis of Intestinal Obstruction

IRA H. LOCKWOOD, M.D., F.A.C.R., F.I.C.S., D.A.B.
KANSAS CITY, MISSOURI

THERE is no better introduction to this subject than the following quotation from Oliver Wendell Holmes, poet, philosopher and anatomist: "The best part of our knowledge is that which teaches us where knowledge leaves off and ignorance begins. Nothing more clearly separates a vulgar from a superior mind, than confusion in the first between the little that it truly knows, on the one hand, and what it half knows and what it thinks it knows on the other."

The truth expressed in this statement seems applicable to the title of this article. The study of the abdomen by scout film has proved so informative in the evaluation of lesions of the abdomen that it is considered an indispensable part of any abdominal diagnostic procedure. The term "scout film" has apparently been applied to the use of a single procedure; it is my impression that it should not be so applied. The technic is necessarily varied, depending on the location and type of lesion under consideration. The requirements for most abdominal conditions are: the anteroposterior, posteroanterior, lateral decubitus film and the erect posteroanterior and anteroposterior views. These projections are the most frequently utilized in this examination, although individual problems will require additional studies.

Many lesions in the abdomen are demonstrated by this type of roentgen examination. Some of the abnormalities are mechanical. The most common is intestinal obstruction. Obstructions of the small bowel are most commonly due to adhesions and external hernias and obstructions of the large bowel to primary carcinoma and volvulus. Wangensteen[1] has listed twenty-one causes of mechanical intestinal obstruction.

More than 80 per cent[2] of all intestinal obstructions involve the small bowel. More

---

From the Research Clinic, Kansas City.

Read at the Twentieth Annual Congress of the United States and Canadian Sections, International College of Surgeons, Philadelphia, Sept. 12-15, 1955.

Submitted for publication Sept. 21, 1955.

than 70 per cent of these are accounted for by obstructive bands and hernias, and more than one-third of all obstructions in the small bowel follow abdominal operations.

Other abdominal conditions detected by means of the scout film study are the paralytic and vascular occlusive diseases; perforation of a hollow viscus with the escape of air into the peritoneal cavity or the retroperitoneal space; calculus, and other diseases of the biliary, urinary and pancreatic tracts; and in children, intrinsic obstruction, which includes congenital obstruction due to atresia or stenosis, and extrinsic obstruction, which is related to embryonic aspects of intestinal rotation. Other conditions observed are soft tumor masses, abscess formation, pelvic disease and rupture of a solid organ, such as the spleen, liver or kidney.

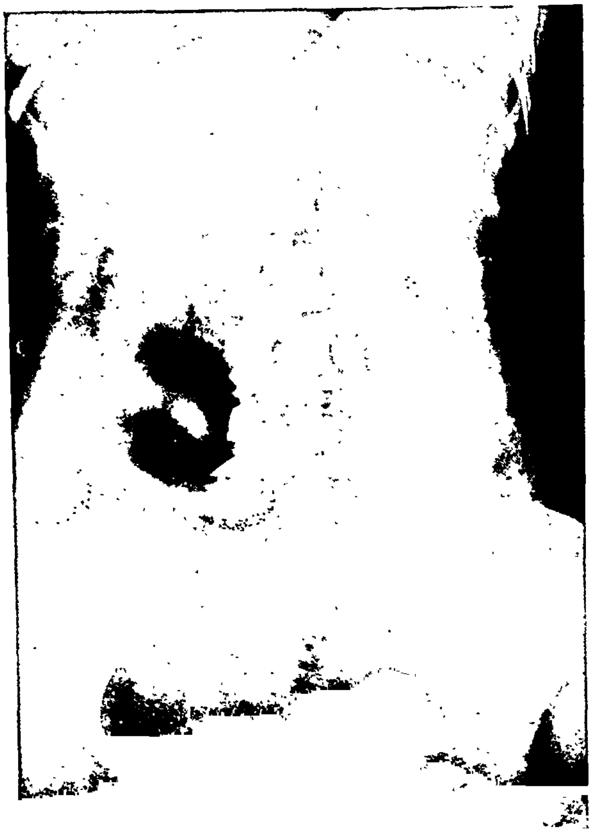


Fig. 1.—Single loop, with loss of vascular markings and obstruction due to adhesions.

Obstruction of the small bowel assumes an important role because of the diagnostic problem it presents and because of its very unfavorable prognosis and the necessity to consider this condition a surgical and radiologic emergency. Most cases of obstruction of the small bowel will present the cardinal symptoms of intestinal colic and vomiting. By intestinal colic I mean the concomitant occurrence of borborygmi at the acme of the pain. Abdominal distention may or may not be present. It is admittedly desirable to establish the diagnosis and institute treatment before distention occurs. Any patient who presents these symptoms must be considered to have intestinal obstruction, and it is imperative that a scout film study of the abdomen be obtained immediately (Fig. 1).

Not only can a roentgenogram of the abdomen indicate the site and degree of obstruction, but it often furnishes information concerning the type. The higher the obstruction, the more the vomiting, the less the distention, the greater the shock and the more severe the electrolytic imbalance. Many writers, including Wangensteen,[3] Pendergrass,[4] Sante,[5] Golden[6] and others have described the characteristic gas pattern in mechanical obstruction and adynamic ileus. Oppenheimer[7] and Wangensteen[3a] have ably discussed the roentgen characteristics of acute transient intestinal atony and spastic ileus. When the roentgenogram indicates gas in the small intestine, one must immediately decide whether the gas is present on the basis of adynamic ileus, inflammatory changes, congenital anomalies or actual mechanical obstruction.

The roentgenogram of mechanical obstruction (Fig. 2) is one in which a loop or loops of intestine are distended with gas. The degree of distention depends upon the site of the lesion and the duration and the degree of obstruction. Should

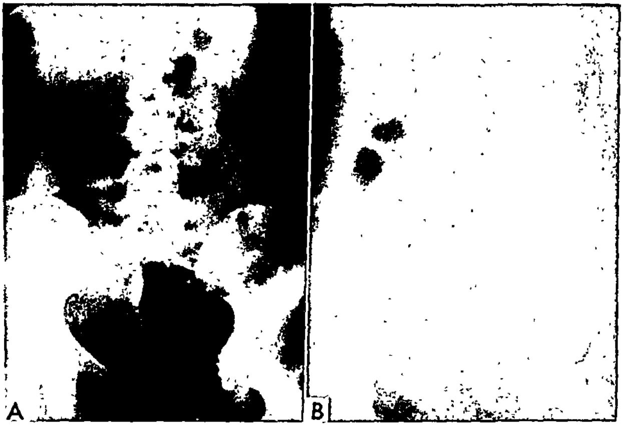


Fig. 2.—*A*, roentgenogram of abdomen at 4 a.m. *B*, roentgenogram at 7 a.m., showing increased distention.

the lesion be of recent origin, only an isolated segment or segments of bowel may show distention until it reaches a point at which multiple coils of small bowel assume a transverse position in the abdominal cavity. The portion of the bowel distal to the obstruction may remain relatively free from gas.

In my own opinion, with the earliest roentgen sign of acute obstruction of the small intestine, that is, the single loop of bowel distended with gas, and a clinical story of obstruction, the "green light"[8] is given for immediate operation. A single loop of obstruction is important from another aspect. It may mean that the blood supply to a segment of intestine is embarrassed if the normal anatomic markings are not clearly defined. The valvulae conniventes are present throughout the small intestine. They are more prominent in the upper portion, being most pronounced in the jejunum. When gangrene occurs (Fig. 3) the bowel quickly loses tone and becomes edematous and blackened. Its physiologic pattern rapidly disappears, and it becomes a smooth-walled tube distended with gas; this is a pathognomonic roentgenologic sign[9] of gangrene or embarrass-

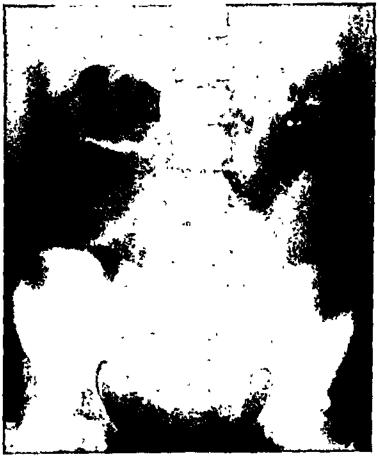


Fig. 3.—Roentgenogram sh char tic of impairment of

ment of blood supply. There is another sign that may have definite value in the diagnosis of gangrene, which has to do with the geometric pattern of the intestine. Single or multiple C-shaped loops of small bowel arising from a common source of pedicle always indicate volvulus. This pattern is accompanied by a loss of the valvulae conniventes, the extent of which is proportionate to the degree of embarrassment of the blood supply. In no case should one correlate the degree of distention observed on the roentgenogram with the severity of the symptoms.

Rendrich and Harrington[10] have described the pathologic picture of the relatively uncommon superior mesenteric thrombosis (Fig. 4). The syndrome is extremely dramatic and fulminating, running its clinical course in but a few hours. The plain roentgenogram of the abdomen shows distention of the whole small bowel as well as the right half of the colon, and, although symptoms have been present only a few hours, the segments will show some loss of the normal anatomic markings of the ileum.

In the presence of regional ileitis, acute abdominal pain follows the ingestion of food when the bowel is stenotic and there is distention of the bowel above the stenotic area. The pain is crampy and is usually associated with diarrhea. When stenosis is severe there is a marked delay in the "transient time." One or more stenotic areas with relatively uninvolved zones[11] may be demonstrated by the scout film study, with the obstruction in both the stenotic and the nonstenotic phase of diffuse areas of blunting and thickening of the mucosal folds, with cobblestoning reticulation and rigidity.[12]

Regional ileitis was originally demarcated as a pathologic entity, since no single histologic feature as described was specific for the disease and since clinically in-

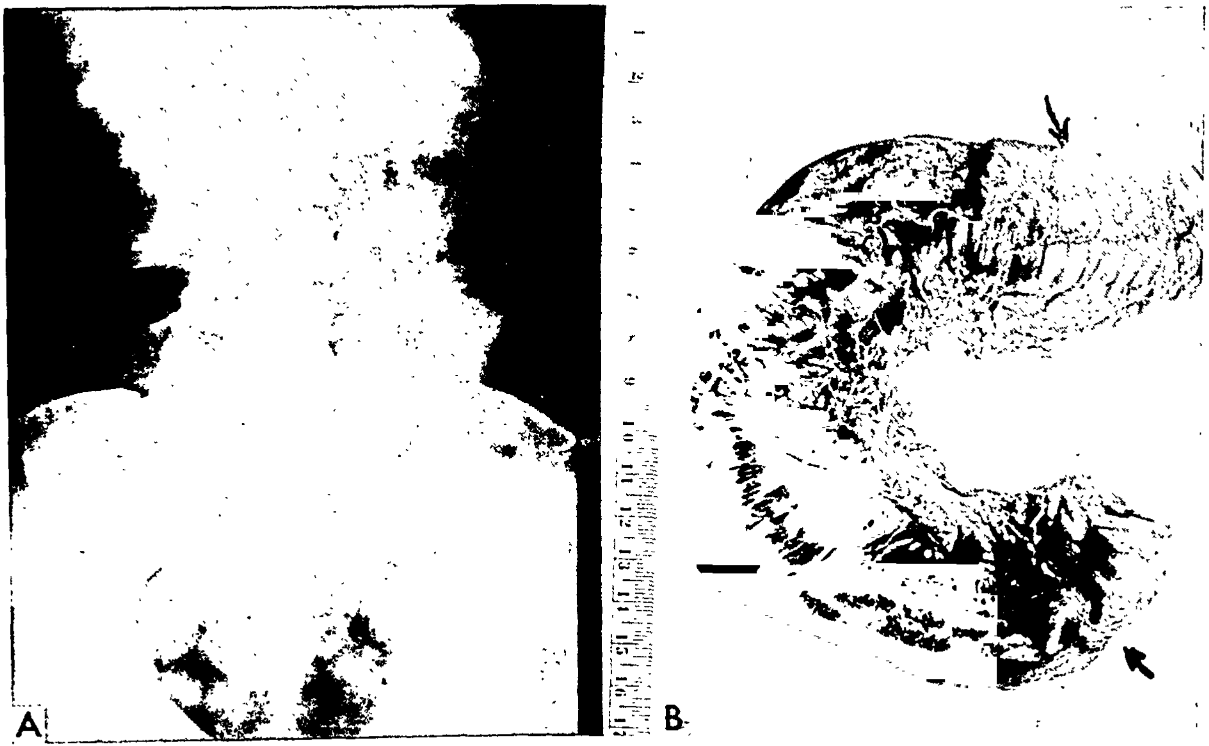


Fig. 4.—*A*, absence of valvulae conniventes in small loop to right of spine. *B*, specimen of gangrenous bowel.

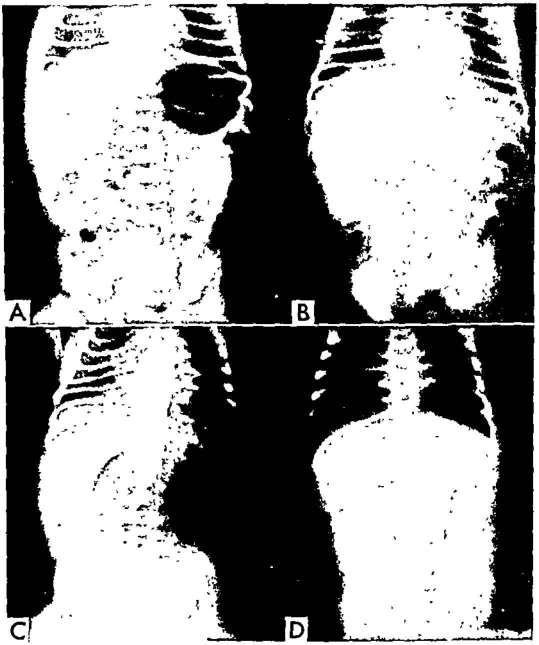


Fig. 5.—*A*, distended stomach of infant 3 days old with duodenal obstruction due to malrotation of intestine. *B*, roentgenogram taken ten days after surgical relief of obstruction. *C*, gas-filled stomach and duodenum proximal to duodenal atresia. *D*, complete retention of opaque medium in stomach and duodenal bulb three hours after barium meal.

flammatory disease of the colon and small intestine may coexist.[13] The cause of the disease remains unknown but the characteristic pathological process has been thoroughly established.

Intestinal obstruction in the newborn (Fig. 5) is nearly always due to congenital anomalies.[14] Until recently, interest in neonatal obstruction of the small intestine was limited to the pathologic study of these anomalies. The extreme normal variations[15] in both distribution and quantity of the gas occurring within the intestinal tract of infants and children reveal that gas reaches the proximal portion of the small bowel during the first hour of life, and by the third hour the entire small bowel contains gas. This time sequence is often delayed until the first feeding, especially if the infant cries little during the interim. Typical, plain films of the abdomen of a newborn child show the gas pattern of the small bowel as multiple, ill defined areas of radiolucency, confined for the most part to the left side of the abdomen. The bowel is not distended, and continuity of loops is undetectable. Occasionally, however, an excessive amount of gas may be observed

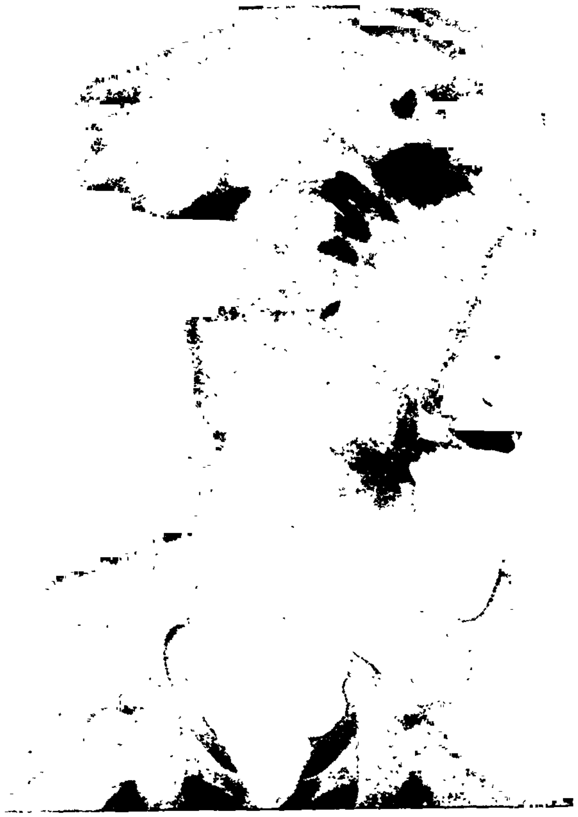


Fig. 6.—Delineation of coils of small intestine within colon, characteristic of intussusception.

in the small intestine of an infant who has swallowed a great deal of air. The intestinal loops may even be distended. In such cases gas is also present within the stomach and colon, presenting an appearance that may simulate mechanical obstruction or paralytic ileus. Fluid levels within both colon and small bowel are not infrequently seen in the absence of obstruction when films are taken with the patient in an upright position.

Careful and accurate analysis of the scout film study of the abdomen has proved a valuable method of early diagnosis. It shows a distended bowel above the block and a collapsed intestine below. Distention of both the stomach and the duodenum in an infant is usually due to congenital bands, stenosis or atresia. The last-mentioned condition is more common than stenosis and occurs more often in the ileum and duodenum; in more than half of the cases it is observed in the duodenum. There is another condition, adrenal cortical insufficiency,[16] which may manifest *itself by severe vomiting and dehydration* simulating high intestinal obstruction. Cases have been described in which the roentgenologic image of the lesion revealed a striking resemblance to high organic intestinal obstruction and the postmortem examination failed to show any obstructive gastrointestinal lesions, the adrenal glands demonstrating a marked diminution in cortical tissue, generalized cortical hyperplasia and a degenerative process.

There are two features[17] in the roentgenogram of the abdomen of the infant that suggest early obstruction of the small intestine. The first consists of a sharp turn of the intestine dilated with air. The other is increasing accumulation of air seen on the serial roentgenograms. Numerous conditions other than intestinal stasis, however, produce air-filled loops in the abdominal roentgenogram. For this reason the diagnosis of intestinal obstruction in the infant must always be supported by positive clinical signs.

Any acute mechanical intestinal obstruction is an absolute surgical and radiological emergency.[18] Pain, abdominal distention and vomiting always indicate a scout film study of the abdomen. This department considers roentgenographic study of the abdomen an absolute emergency, day or night. When the outcome of such an examination indicates obstruction of the small bowel, the patient is operated upon immediately unless so much distention is present or the physiologic picture is altered to such an extent that surgical intervention is not deemed wise. In the latter event, decompression must be carried out. A presumptive diagnosis of embarrassment of blood supply always means immediate operation.

Meconium ileus must always be sus-

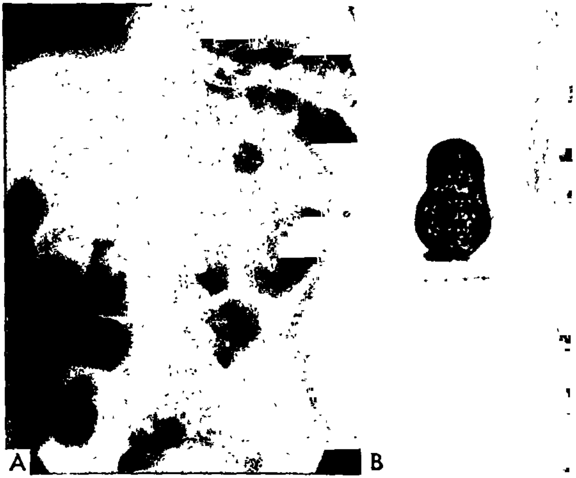


Fig. 7.—Roentgenogram demonstrating that soft tissue tumor masses, such as fibroma, often cause intussusception.

pected in a newborn infant with clinical and roentgen signs of obstruction of the small bowel and a negative history for the passage of meconium. The colon may be contracted, in contrast to the dilated small intestine, which is filled with a tenacious material. Meconium peritonitis is due to extrusion of meconium through a rupture of the bowel. It occurs during the last month of fetal life and in the newborn. Roentgen examination is made with a demonstration of free air and irregularly distributed calcifications in the peritoneal cavity. Fibrocystic disease of the pancreas is a frequently associated observation, and examination of the chest may also show pulmonary enphysema.

Acute intussusception[19] may produce complete obstruction of either the small or the large bowel, in which event the signs are those of mechanical obstruction. When the small bowel is intussuscepted (Fig. 6) into the cecum and ascending colon, preliminary films may reveal exclusion of gas from the right side of the colon and excess gas in the small bowel proximal to the portion that is intussuscepted. Occasionally there is enough gas in the cecum and ascending colon to outline the intussuscepted ileum.

Introduction of barium sulphate suspension into the colon by enema outlines the characteristic ringlike shadows of the intussuscepted portion of the bowel and a concavity in the column of the advancing barium mixture, produced by the invaginated portion.

Intussusception is occasionally due to a tumor (Fig. 7), a diverticulum or a gallstone that pulls the bowel with it as it moves forward by peristaltic action. Sometimes sufficient gas is present in the intussuscepted bowel for visualization of a tumor or other space-occupying lesion that produces intussusception, which is often demonstrable on a scout film study

Paraduodenal ([illegible] 8) [illegible] etro
neal hernia[20] i [illegible]

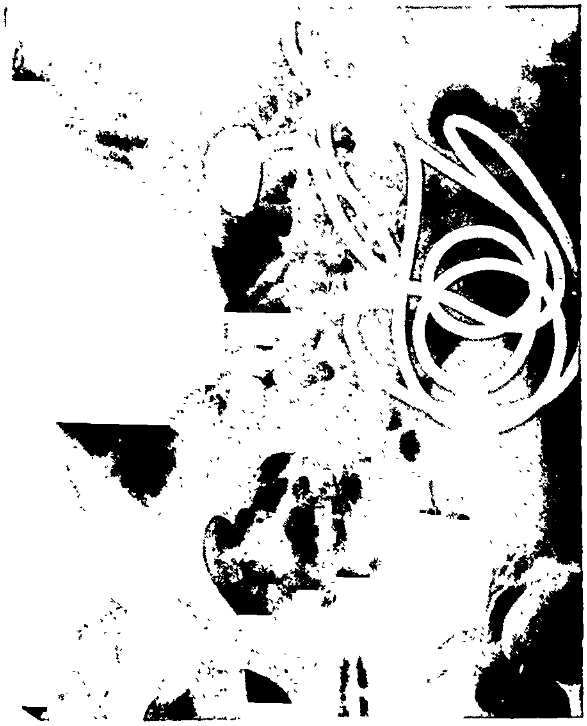


Fig. 8.—Unusual circular course of Miller-Abbott tube, due to paraduodenal hernia.

intestinal obstruction. The roentgen signs are the absence of loops of small bowel in the pelvis with the patient in an erect position, with a collection of distended loops of small bowel that appear to be confined within a hernial sac. Retroperitoneal hernias of the small intestine occur through an opening in the mesentery through the fossa about the cecum and through the lesser peritoneal sac; these are not frequent but must be considered when the scout film study shows excess gas in loops of the small bowel, especially when the coils are closely bunched in an abnormal position.

Decompression as a phase of treatment can be a powerful adjunct to definitive surgical intervention or can be the doom of the patient. It is logical to assume that the patient who presents either the clinical or the roentgen picture of distention needs decompression. To avoid the phase of distention, early operation is imperative. I am convinced that immediate operation is indicated for all types of loop obstruction, whether it is due to embarrassment of blood supply or to simple extraneous involvement. If the picture is one of distention, and particularly if the patient is in a state of chemical imbalance, decompression is indicated; however, one must be absolutely sure that the vitality of the intestine is not endangered. It is well to emphasize that no patient should ever be intubated if the blood supply of the intestine is in jeopardy, and that no type of intestinal intubation or decompression need be used if an early diagnosis is established and a definitive surgical operation carried out. In my opinion, no attempt should be made to intubate a distended large bowel with no gas in the small intestine; nor do I approve of passing a Miller-Abbott tube in an attempt to prevent ileus.

In the use of the scout film study of the abdomen, ileus[21] is the disease process most frequently observed. The roentgen picture is one in which the gas lies in multiple pockets, giving the impression that the gas "stops where it may." It may progress to a point at which the gas becomes so abundant that the coils of the intestine assume a transverse position in the abdominal cavity; however, the colon contains varying amounts of gas throughout its entire length, as does the stomach. The determination of the presence, type and cause is therefore one of the important functions of the roentgen examination of the acutely diseased abdomen. At times this may be difficult or even impossible without the careful correlation of the clinical observations, especially when excess gas and fluid are widely and uniformly distributed in the small and large bowel without definite evidence of a block. Such an appearance is due to paralytic or adynamic ileus, most commonly occurring in the postoperative patient.

Paralytic ileus not infrequently follows cerebral vascular operations, coronary occlusion, acute biliary and urinary colic and shock from severe trauma.

Another manifestation of ileus,[22] described by Wangensteen as spastic ileus, is sometimes seen in cases of mesentery vascular occlusion, with distention of the small bowel and the colon as far as the splenic flexure. Negative results from a barium enema study will rule out a mechanical obstruction at the splenic flexure and support the diagnosis of vascular obstructive or spastic ileus.

Regional or segmental ileus[23] is observed in the presence of localized acute inflammatory disease, such as regional ileus, cholecystitis, pancreatitis or appendicitis. The site of the ileus suggests the area of primary disease. A carefully taken clinical history and physical examination will help to localize the acute inflammatory process. This fact, however, does not lessen the importance of the roentgen demonstration of segmental ileus, since it is often the most conclusive evidence of acute abdominal disease and frequently makes possible its localization, particularly in the case of an acutely enlarged inflamed gallbladder or appendiceal inflammatory process, or in the presence of pelvic lesions.

There are definite indications of intubation in cases of ileus in which there is disruption of the flow of the bowel contents by means of a nervous or muscular nervous mechanism. Bearing in mind that the picture of ileus is one in which the gas lies in multiple pockets and may become so abundant that the coils of intestine assume a transverse position in the abdominal cavity, the colon nevertheless usually contains varying amounts of gas throughout its length. Close cooperation is necessary between the internist, the surgeon and the radiologist, and there should be an accurate history to correlate with the roentgenogram. If the observations indicate an embarrassment of the blood supply, immediate operation is the only method of choice, and should the diagnosis of obstruction of the large bowel be in doubt a careful barium enema is indicated to rule out such a possibility.

In the scout film study of the abdomen one must remember that only 20 per cent of the obstructive lesions occur in the large bowel. When a diagnosis of obstruction is made, and when the scout film study reveals excess gas and fluid in both the small and the large bowel, with an abrupt ending of the gas shadow in the colon, despite such clear cut evidence a barium enema is indicated for better localization of the obstructive lesion.

Volvulus of the colon should be suspected when a scout film study shows tremendous distention (to the point of effacement of the haustral markings) with a high index of elongation of the bowel and mobility of the mesentery. In the presence of volvulus of the cecum and ascending colon[24] a scout film study reveals extreme distention of the right half of the colon by gas and fluid, with one or two fluid levels in the involved area. Marked distention of the right half of the colon is the outstanding roentgen sign; the diagnosis is difficult because of the migration of the cecum to an unusual location, often in the upper left quadrant. Although the consensus is that a preoperative diagnosis of volvulus of the cecum and ascending colon is seldom made, the possibility of an accurate diagnosis by radiographic means has been mentioned.[25] Failure of fixation is recognized as the principal cause of mobility of the right half of the colon; this anomaly might be seen in association with nonrotation, partial rotation and reverse rotation of the midgut or with an undescended or hyperdescended cecum.

Volvulus of the transverse colon constitutes one of the rarest forms of mechanical obstruction of the large bowel[26] and reliable radiologic documentation of such an accident occurring in a normally developed colon is unusual.

Volvulus of the sigmoid is an important cause of colonic obstruction. Early diagnosis and immediate institution of proper therapy are essential. Prompt relief of the obstruction is necessary to prevent strangulation and necrosis of the bowel.[27] The characteristic signs are linear curved densities alternating with bands of increased radiolucency. The cause is a congenital increase in the length of the sigmoid and its mesentery, chronic recurrent constipation and inflammation with adhesions at the base of a long sigmoid loop.[28]

Scout film study of the large bowel, except in cases of volvulus or intussusception, should yield very little except in combination with other methods of study. Colonic obstruction produces symptoms that lead to digital, proctoscopic and radiologic examination in most cases before obstruction takes place.

SUMMARY

An attempt is made to point out the more obvious conditions that are discovered by the scout film study of the abdomen in the diagnosis of intestinal obstruction.

ZUSAMMENFASSUNG

Es liegt ein Versuch vor, die auffälligen Veränderungen, die sich an der Röntgenleeraufnahme des Bauches bei der Diagnose des Darmverschlusses entdecken lassen, hervorzuheben.

SUMARIO

Uma tentativa é feita no sentido de apontar as condições mais óbvias que se apresentam no estudo de filme (scout film) do abdomen no diagnóstico da obstrução intestinal.

RESUMEN

Se intenta señalar los hallazgos más obvios que se obtienen en la placa simple de abdomen en el diagnóstico de la oclusión intestinal.

RÉSUMÉ

L'auteur essaye de mettre au point les conditions les plus manifestes, qui sont découvertes par un film préliminaire de l'abdomen pour la diagnose de l'occlusion intestinale.

REFERENCES

1. Cited by Smith, G. A.; Perry, J. F., and Yonehiro, E. G.: Mechanical Intestinal Obstruction, Surg., Gynec. & Obst. **100**:651-660, 1955.

2. Hodgson, F. H.: Intestinal Obstruction and Fluid Balance, Missouri Med. 52:107-113, 1955.

3. Wangensteen, O. H.: (a) Intestinal Obstruction. Springfield, Ill.: Charles C Thomas, Publisher, 2nd ed. (b) Elaboration of Criteria upon Which the Early Diagnosis of Acute Intestinal Obstruction May Be Made, with Special Consideration of the Value of X-ray Evidence, Radiology 17:44-62, 1931. (c) Wangensteen, O. H., and Pain, J. R.: Treatment of Acute Intestinal Obstruction by Suction with Duodenal Tube, J.A.M.A. **101**:1532-1539, 1933.

4. Pendergrass, E. P.: Role of Roentgenologic Examination in Diagnosis of Intestinal Obstruction, New England J. Med. 225:637-641, 1941.

5. Sante, L. R.: Intestinal Obstruction, Am. J. Roentgenol. 34:744-753, 1935.

6. Golden, R.: Radiologic Examination of the Small Intestine. Philadelphia: The J. B. Lippincott Company, 1945.

7. Oppenheimer, A.: Acute Transient Intestinal Atony, Am. J. Roentgenol. 41:575-580, 1939

8. Lockwood, I. H.; Smith, A. B., and Walker, J. W.: Acute Small Intestinal Obstruction, Radiology 51:310-319, 1948.

9. Lockwood, I. H.; Smith, A. B., and Walker, J. W.: Acute Small Intestinal Obstruction, Radiology 51:310-319, 1948.

10. Rendrich, R. A. and Harrington, L. A.: Roentgenologic Observations in Mesenteric Thrombosis, Am. J. Roentgenol. 52:317-322, 1944.

11. Crohn, B. B., and Janowitz, H. D.: Reflections on Regional Ileitis Twenty Years Later, J.A.M.A. 156:1221-1225, 1954.

12. Marshak, R. H.; Friedman, A. I.; Wolf, B. S., and Crohn, B. B.: Roentgen Findings in Ileojejunitis, Gastroenterol. 19:383, 1951.

13. Hadfield, G.: The Primary Histological Lesion of Regional Ileitis, Lancet 2:773, 1939. Warren, S. and Sommers, S. C.: Pathology of Regional Ileitis and Ulcerative Colitis, J.A.M.A. 154:189, 1954.

14. Craig, R. M.; Hodgson, J. R., and Dockerty, M. D.: Obstruction of Small Intestines in Infants and Children, Am. J. Roentgenol., Rad. Therapy & Nuclear Med. 72:412-425, 1954.

15. Smith, G. A.; Perry, J. F., and Yonehiro, E. G.: Mechanical Intestinal Obstruction, Surg., Gynec. & Obst. 100:851-660, 1955.

16. Weems, H. S., and Golden, A.: Adrenal Cortical Insufficiency in Infants Simulating High Intestinal Obstruction, Am. J. Roentgenol., Rad. Ther. & Nuclear Med. 74:213-219, 1955.

17. Craig, R. M.; Hodgson, J. R., and Dockerty, M. D.: Obstruction of Small Intestines in Infants and Children, Am. J. Roentgenol., Rad. Ther. & Nuclear Med. 72:412-425, 1954.

18. Hunt, J.: The Early Clinical and Radiological Manifestations of Small Bowel Obstruction, Southern Surgeon 12:62-70, 1946.

19. Young, B. R.: Roentgen Examination of the Acute Abdomen, Radiology 64:482-497, 1955.

20. Lockwood, I. H., and Lockard, V. M.: Lesions of the Small Intestine, J. Internat. Coll. Surgeons 14:57-64, 1950.

21. Young, B. R.: Roentgen Examination of the Acute Abdomen, Radiology 64:482-497, 1955.

22. Wangensteen, O. H.: Value of Diagnostic Criteria for the Choice of Therapy Procedure in the Management of Acute Intestinal Obstruction: Experimental and Clinical Observation, Radiology 35:680-698, 1940.

23. Young, B. R.: Roentgen Examination of the Acute Abdomen, Radiology 64:482-497, 1955.

24. Figiel, L. S., and Figiel, S. J.: Volvulus of the Cecum and the Ascending Colon, Radiology 61:496-515, 1953.

25. Buckstein, J.: Digestive Tract in Roentgenology. Philadelphia: The J. P. Lippincott Company, 1948. Dixon, C. F., and Myer, A. C.: Volvulus of the Cecum, S. Clin. North America 28:953-963, 1948. Gerwig, W. H. Jr.: Volvulus of the Colon, Arch. Surg. 60:721-742, 1950. Lindner, H. H., and Marcus, S.: Acute Volvulus of the Cecum: A Method of Diagnosis with a Report of a Case, California Med. 72:78-60, 1950. McGraw, J. P.; Kremen, A. J., and Rigler, L. G.: Roentgen Diagnosis of Volvulus of the Cecum, Surgery 24:793-804, 1948. Pratt, J. P., and Fallis, L. S.: Volvulus of the Cecum and Ascending Colon: Report of Three Cases, J.A.M.A. 89:1225-1230, 1927. Rixford, E.: Failure of Primary Rotation of the Intestine (Left Sided Colon in Relation to Intestinal Obstruction), Ann. Surg. 72:114-120, 1920. Sweet, R. H.: Volvulus of the Cecum, Acute and Chronic, with a Report of Eight Cases, New England J. Med. 213:287-293, 1935. Wolfer, J. A.; Breaton, L. E., and Anson, B. J.: Volvulus of the Cecum: Anatomical Factors in Its Etiology; Report of a Case, Surg., Gynec. & Obst. 74:883-894, 1942.

26. Figiel, L. S., and Figiel, S. J.: Volvulus of the Transverse Colon, Radiology 63:832-835, 1954.

27. Ritvo, M., and Golden, J. L.: Roentgen Diagnosis of Volvulus of the Sigmoid with Intestinal Obstruction, Am. J. Roentgenol. 56:480-488, 1946.

28. Campbell, D. A., and Smith, R. G.: S. Clin. North America 30:603-611, 1950.

* * *

I believe in the United States of America as a government of the people, by the people, for the people; whose just powers are derived from the consent of the governed; a democracy in a republic; a sovereign nation of many sovereign states; a perfect union, one and inseparable; established upon those principles of freedom, equality, justice and humanity for which American patriots sacrificed their lives and fortunes. I therefore believe it is my duty to my country to love it, to support its constitution, to obey its laws, to respect its flag, and to defend it against all enemies.

—*Page*

I feel that you are justified in looking into the future with true assurance, because you have a mode of living in which we find the joy of life and the joy of work harmoniously combined. Added to this is the spirit of ambition which pervades your very being, and seems to make the day's work like a happy child at play.

—*Einstein*

Abdominal Exposure for Suspected Appendicitis

K. WILSON JAMES, M.R.C.P. (Edin.), F.R.C.S. (Edin.), F.I.C.S.*

KINGSTON, JAMAICA

APART from its usual anatomic sites, the appendix may be found in a variety of abnormal places in the abdomen, varying from the interior of a hernial sac to inclusion in an intussusception. Its position in the abdominal cavity, moreover, is subject to variation due to adhesions to other organs, etc., as well as to such things as developmental abnormalities of rotation and descent. It follows that appendectomy has been performed through a variety of incisions, some deliberate and planned, and some fortuitous and occasioned by force of circumstances.

The appendix is occasionally removed, for example, during operations for diseases of the gallbladder or the stomach, through the incisions designed for these more extensive procedures. And, although its removal under these circumstances may be difficult and may have to be abandoned in favor of a separate incision for the appendectomy, certain exposures, such as the upper abdominal transverse and the upper paramedian, which can be prolonged downward, lend themselves particularly to an easy appendectomy.

This article, however, is intended to deal specifically with cases in which deliberate incisions are made for appendectomy, and not with cases in which the operation is done secondarily after some larger procedure. The discussion will thus cover these cases in which a diagnosis of acute, subacute or chronic recurrent appendicitis has been absolutely or tentatively made and operation decided upon as a result.

Usually the surgeon, in deciding on the incision to be made in a given case, is guided by certain fundamental principles, the importance of which has been well established and the chief of which are as follows:

1. Anatomic considerations. These would include consideration of possible vagaries in position of the viscera, the disposition of nerves and muscles, and the supply. The aim in view is to insure the minimum of operative damage, the achievement of firm healing with good cosmetic results and, ultimately, the obviation of incisional hernia and persistent pain in the operative area.
2. Consideration of the acuteness of the condition and the possible presence or absence of pus.
3. Consideration of the available means of obtaining satisfactory access to the suspected lesion.
4. Consideration of the exploratory possibilities in view of the differential diagnosis.
5. Consideration of ways and means of facilitating extension of the field of operation in the face of difficulties and complications that may attend the procedure.

Surgeons have long recognized the fact that an abdominal operation should always be undertaken, when possible, in the spirit of a laparotomy, and the operating surgeon would do well to remember that the mere satisfactory removal of an appendix in a case of right-sided pain is not an end in itself. The ideal operation should restore the patient to perfect health, and this is better attained by one operation and proper exploration than by a series of procedures based on trial and error.

---

*Hon. Consulting Surgeon, Kingston Public Hospital, Kingston.

Submitted for publication June 17, 1955.

In considering an appendectomy, the surgeon has his choice of a variety of incisions, and these, like the tools of a master workman, are each fitted for advantageous use in some particular endeavor. He should therefore choose his incision with the same meticulous care as the latter chooses his instruments. Only in this way will the ideals of surgery in this particular field be realized.

Suspected acute appendicitis has the nature of an emergency. The patient is frequently unprepared for the hazard, toxic and perhaps dehydrated. Even with adequate preoperative preparation the simplest and most direct surgical approach is safest here, with avoidance of wide undercutting of tissue planes and extensive opening of muscle sheaths. The incision should also insure easy and quick postoperative closure of the wound and should carry a minimum risk of later incisional hernia.

On the other hand, subacute and recurrent abdominal pain in the right iliac fossa calls for a more timely operation and a more thorough exploration of the abdominal cavity.

Apart from the formidable list of possible causes of right-sided pain in the lower part of the abdomen, multiple pathologic conditions associated with appendicitis itself are frequent, especially in the female. In as many as 20 per cent of women operated on in a personal series, some pelvic adnexal pathologic condition was present in addition to the diseased appendix. This is especially liable to be the case if the position of the appendix is pelvic, a situation that makes an incision like McBurney's particularly undesirable, except for small children. The pelvic adnexal disease that often coexists with appendicitis is apt to be overlooked if a small exploratory incision is used, and the same applies to any other pathologic condition that may be present.

Several incisions are available in cases of suspected appendicitis:

McBurney's Incision: This enjoys wide popularity and is used in the vast majority of appendectomies performed. It gives easy access to the appendix in most cases and offers a satisfactory approach to the majority of abscesses. It also enjoys the reputation of being most rarely followed by postoperative hernia. It is the incision of choice for children and for adults in whose cases the diagnosis is certain or abscess is suspected. It is also preferable when operation is being done with the region under local anesthesia.

In patients over 60 years of age, too, in whom appendicitis is less common (only 2 per cent of surgical cases, according to Simpson), McBurney's incision offers the advantage of enabling one to do a prompt cecostomy should the condition turn out to be obstruction of the large bowel.

This incision is, however, associated with certain distinct pitfalls and disadvantages, and these deserve emphasis, as they are often apparently forgotten:

First, there is the danger of inclusion of the ilioinguinal nerve in a ligature. The ilioinguinal nerve occasionally passes superficially but often pierces the fibers of the internal oblique muscle. At times it lies beneath that muscle. In any case, the nerve is in danger of inclusion in any ligature blindly placed through the fibers of the internal oblique muscle, and its inclusion undoubtedly accounts for a number of cases of postoperative pain after operations with McBurney's incision. In this connection it must be stressed that the practice of suturing blindly, as many do, the fibers of the internal oblique muscle is not without danger of including this nerve, and the figure-of-eight suture used by some surgeons is particularly dangerous. These ligatures, moreover, tend to produce ischemic necrosis of the muscle fibers, especially if drawn tightly, and should be used with great reserve and considerable caution. Many surgeons insert no suture at all into the internal oblique muscle. There is much to be said in favor of this.

It is also claimed by some that the internal ring is weakened if the ilioinguinal nerve is injured, as this nerve supplies the conjoined tendon, weakness of which facilitates onset of a hernia in the inguinal region.

Another great disadvantage of McBurney's incision lies in its restriction of thorough exploration, especially when one is dealing with subacute and chronic disease in a female patient. It is true that the incision can be extended by incising either along the outer side of the rectus sheath or transversely across it, with retraction of the fibers. Even this, however, does not permit really thorough exploration, and in my opinion this incision should rarely if ever be used except in cases of the acute condition, as access to both sides of the pelvis is impossible and exploration of the abdomen is limited indeed.

The Pararectal (Battle's) Incision: This incision, if modified by retraction outward of the rectus muscle to avoid damage to the eleventh and twelfth thoracic nerves, has much to recommend it, and is without some of the disadvantages of McBurney's. It may not be as nearly ideal as is McBurney's in dealing with certain acute conditions or in tackling some abscesses, but it is certainly superior to the latter in the surgical treatment of subacute, recurrent or chronic right-sided pain in adults, particularly women. It also gives quite a satisfactory exposure in cases of emergency, and the upper part of the abdomen is easily explored by its extension.

The Transrectal Incision: This resembles Battle's incision but involves separation of the rectus fibers with possible injury to the nerve supply. Although injury to a single nerve is not of grave consequence, the incision has little to recommend it.

The Paramedian Incision: This incision shares some of the advantages of the pararectal and offers even greater facilities for exploration. There is access to the appendix and to both sides of the pelvis, and the incision can be prolonged upward to make it possible to explore the upper part of the abdomen. The incision, however, has the slight disadvantage of requiring a little greater retraction to obtain adequate exposure of the pelvis.

The Midline Incision: This is not used by surgeons nowadays, since it results in a weakened scar and in special liability to hernia. It is common, however, for surgeons to make the midline incision through the skin only and to open the rectus sheath on one side, proceeding as with the paramedian incision.

The Modified Transverse Suprapubic Incision: This has certain advantages. It follows in the skin crease, running transversely, with a slight curve downward, a fingerbreadth above the symphysis pubis, with its midpoint at the midline. A skin flap is raised as in the goiter collar incision in the neck and, after ligature of the superficial epigastric vessels, the wound becomes absolutely avascular and a flap is easily elevated almost to the umbilicus. A vertical incision is then made on either side of the midline through the right rectus sheath, exactly as in the paramedian incision, and the operation continues as with the latter.

The incision differs from the Pfannenstiel in being lower—exactly in the region of the pubic hair—and in the fact that the rectus sheath is incised longitudinally in the direction of its fibers and the latter retracted outward. A firm invisible scar covered by suprapubic hair results, and the cosmetic aspect of the incision is perfect.

The transverse suprapubic incision is

ideal for pelvic operations. It also gives satisfactory exposure in dealing with subacute and chronic recurrent appendicitis, especially in women.

The Lanz Incision: This is a modification of McBurney's incision and gives excellent exposure and a good cosmetic result. It begins at the level of the anterior superior iliac spine and runs transversely in the skin crease. The deeper dissection is similar to McBurney's. This incision is specially favored in dealing with an abscess of the appendix.

The Rutherford Morrison Iliac Incision: This also gives good exposure. It runs obliquely downward and inward in the flank, just internal to the anterior superior iliac spine. The external oblique muscle is split parallel with its fibers, and the internal oblique and the transversalis muscles are cut in the direction of the incision. The incision lies between the eleventh and twelfth thoracic nerves, so that these escape injury. If necessary, the sheath of the rectus is opened and the muscle retracted medially, after which the posterior sheath is divided. At the end of the operation the abdominal wound is closed in layers.

This article is not by any means intended to be exhaustive, but only to stress certain points in the choice of an incision in operating for suspected appendicitis. It is to be emphasized that no single established incision can be recommended as the one of choice. Each case should be judged on its own merits, and the slavish adopting of any established incision, especially McBurney's, is most undesirable.

The operation for suspected appendicitis may prove simple, but it may also prove tedious and difficult. Similarly, the pathologic condition present may be simple, but it may also be multiple and complex. The abdominal exposure has much to do with the success of the operation and the ultimate well-being of the patient, and the surgeon who aims at conferring lasting benefit on his patient will do well to bear these facts in mind when deciding on his incision.

SUMMARY

In cases of suspected acute appendicitis, McBurney's, Lanz's and Rutherford Morrison's incisions usually offer direct access to the appendix and are to be preferred, especially in dealing with a possible abscess. The paramedian and the modified Battle's incision also offer good exposure, and may be preferable when diagnosis is somewhat doubtful.

In cases of chronic recurrent and subacute appendicitis, especially in women, the transverse suprapubic, the modified Battle and the paramedian are the incisions of choice. In such cases McBurney's incision should rarely be used (except in children), as it does not permit satisfactory exploration.

The transverse suprapubic incision leaves an invisible scar and shares in most of the advantages of the others. It has much to recommend it and gives excellent results.

ZUSAMMENFASSUNG

In den meisten Fällen von Verdacht auf akute Blinddarmentzündung, besonders wenn es sich um die Möglichkeit eines Abszesses handelt, verdienen die von McBurney, Lanza und Rutherford Morrison angegebenen Einschnitte den Vorzug und bieten einen unmittelbaren Zugang zum Blinddarm. Der Paramedianschnitt und der modifizierte Battlesche Einschnitt ermöglichen ebenfalls eine gute Exposition und sind vielleicht vorzuziehen, wenn die Diagnose zweifelhaft ist.

Bei chronischen rückfälligen und subakuten Blinddarmentzündungen (besonders bei Frauen) sind die transversalen suprapubischen, der modifizierte Battlesche und

die paramedianen Einschnitte die Methoden der Wahl; hier sollte ausser bei Kindern der McBurneysche Schnitt nur in Ausnahmefällen angewandt werden, weil er keine befriedigende Explorierung gestattet.

Der transversale suprapubische Schnitt hinterlässt keine sichtbare Narbe und bietet alle Vorzüge der anderen Einschnitte und ist daher sehr zu empfehlen, um so mehr als er auch zu ausgezeichneten Ergebnissen führt.

RIASSUNTO

Nei casi di sospetta appendicite acuta di solito si usano le incisioni di McBurney, di Lanz e di Rutherford Morrison che offrono un accesso diretto all'appendice e specialmente in caso di ascesso. Anche l'incisione paramediana e l'incisione di Battle modificata danno una buona luce e sono indicate quando la diagnosi è dubbia.

Per l'appendicite cronica e ricorrente, sopratutto nelle donne, l'incisione di scelta è la sovrapubica trasversale, o la Battle modificata o la paramediana; il taglio di McBurney deve essere impiegato di rado tranne che nei bambini, perchè non consente una esplorazione completa.

L'incisione sovrapubica trasversale lascia una cicatrice invisibile e possiede la maggior parte dei vantaggi delle altre incisioni e pertanto deve essere raccomandata particolarmente.

RÉSUMÉ

En cas de soupçon d'une appendicite aigue les incisions de Mc. Burney, Lanza et Rutherford Morrison offrent généralement l'accès directe à l'appendice et ils sont préférables, spécialement si la possibilité d'un abscès existe. Aussi l'incision paramédiane et la modification de Battle offrent un bon accès et ils sont préférables, si la diagnose et un peu douteuse.

Pour les récidives de l'appendicite chronique et subaigue (spécialement chez les femmes) les incisions suprapubique transverse, Battle modifié et paramediane sont les incisions indiquées, l'incision de Mc. Burney sera choisie rarément, excepté chez les enfants, puisque l'exploration n'est pas satisfaisante.

L'incision suprapubique, transverse, qui laisse une cicatrice invisible et offre touts les avantages des autres incisions, est bien recommandée et donne des résultats excellents.

BIBLIOGRAPHY

Keith, A.: Human Embryology and Morphology, Wood: Arnold, 1933.

Manning, J. J.: Brit. M. J. 2:770 (Dec. 9) 1944.

Dodd, H.: Brit. M. J. 1:63 (Jan. 12) 1946.

Simpson, D. G.: Brit. M. J. 2:986 (Dec. 28) 1946.

Carling, E. R., and Ross, J. P.: Brit. Surg. Practice, 1951.

Moir, J. C.: Brit. Surg. Practice 2:1415, 1954.

Bourne, A.: Brit. Surg. Practice 1:45, 1955.

◆

> The spirit of conversation consists far less in the exhibition of one's own talents than in enabling others to show theirs. He who leaves you pleased with himself and with what he has said is also perfectly pleased with you.
>
> —*La Bruyére*

The Use of Catgut Sutures in Tantalum Gauze Hernia Repair

A. J. SPIRE, M.D., AND L. J. SPIRE, M.D., A.I.C.S.

SYRACUSE, NEW YORK

MANY volumes have been written about hernias and their repair, but the subject will be interesting as long as the condition exists, repairs are performed and recurrences take place. It is not our intention to introduce anything new, but rather to broaden the field of surgical repair of hernial defects.

Our attention was first focused on tantalum gauze as an adjunct to anatomic structures in hernia repair in 1948. On May 4, 1948, two large incisional defects were closed with No. 0 chromic catgut, reinforced by tantalum gauze which was anchored with No. 0 chromic catgut. The first case has been followed up to the present time. From May 1948 through June 1954, 62 hernias of different types have been repaired by this method. Fifty of the repairs have been checked prior to this writing, and 2 patients died shortly after the operation.

Of the 62 repairs there has been 1 known recurrence in a woman who had

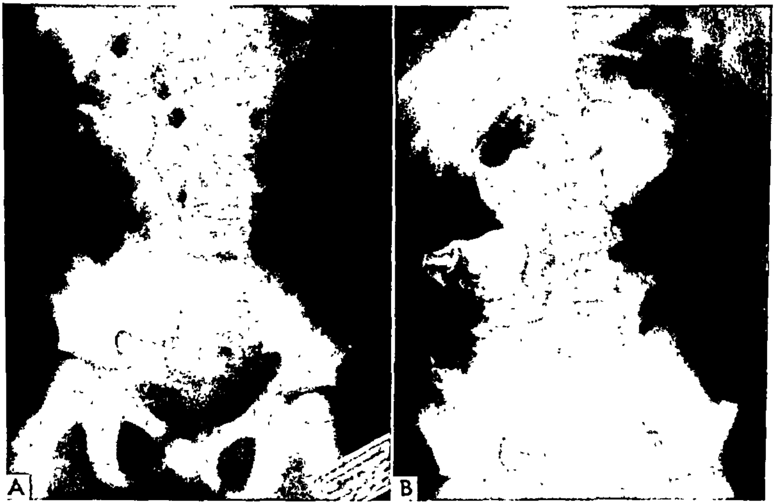


Fig. 1.—*A*, condition of gauze nine days after the operation. *B*, dense fibrous tissue and metallic repair eighteen months later.

Submitted for publication March 16, 1955.

undergone two previous repairs of a lower midline incision. She was a factory worker who did heavy lifting. Two years after the tantalum gauze repair the gauze actually split in the middle while she was lifting a heavy object. Another repair was performed, which, up to the time of this report, is doing nicely.

There were 2 deaths in the series, 1 from an incisional hernia and the second following repair of a meningocele.

One case of persistent draining sinus has been encountered. This, in our opinion, was caused by our own poor surgical judgment in attempting to use the gauze to repair an umbilical hernia in a young undernourished child. The mesh was removed in an office procedure and the wound healed spontaneously and well.

Vaginal plastic procedures can be discouraging; however, we had an excellent result in 1 case of a large cystocele, which developed many years after a vaginal hysterectomy. The gauze is still palpable under the vaginal mucosa, but the repair is excellent and the patient has no discomfort.

It has been advocated on at least one occasion that gelfoam be placed over the gauze at the time of repair. We had tried this procedure and found it unsatisfactory; subsequent trials were equally discouraging, so the practice was dropped. It was our experience that serum drainage from the wound was excessive for weeks

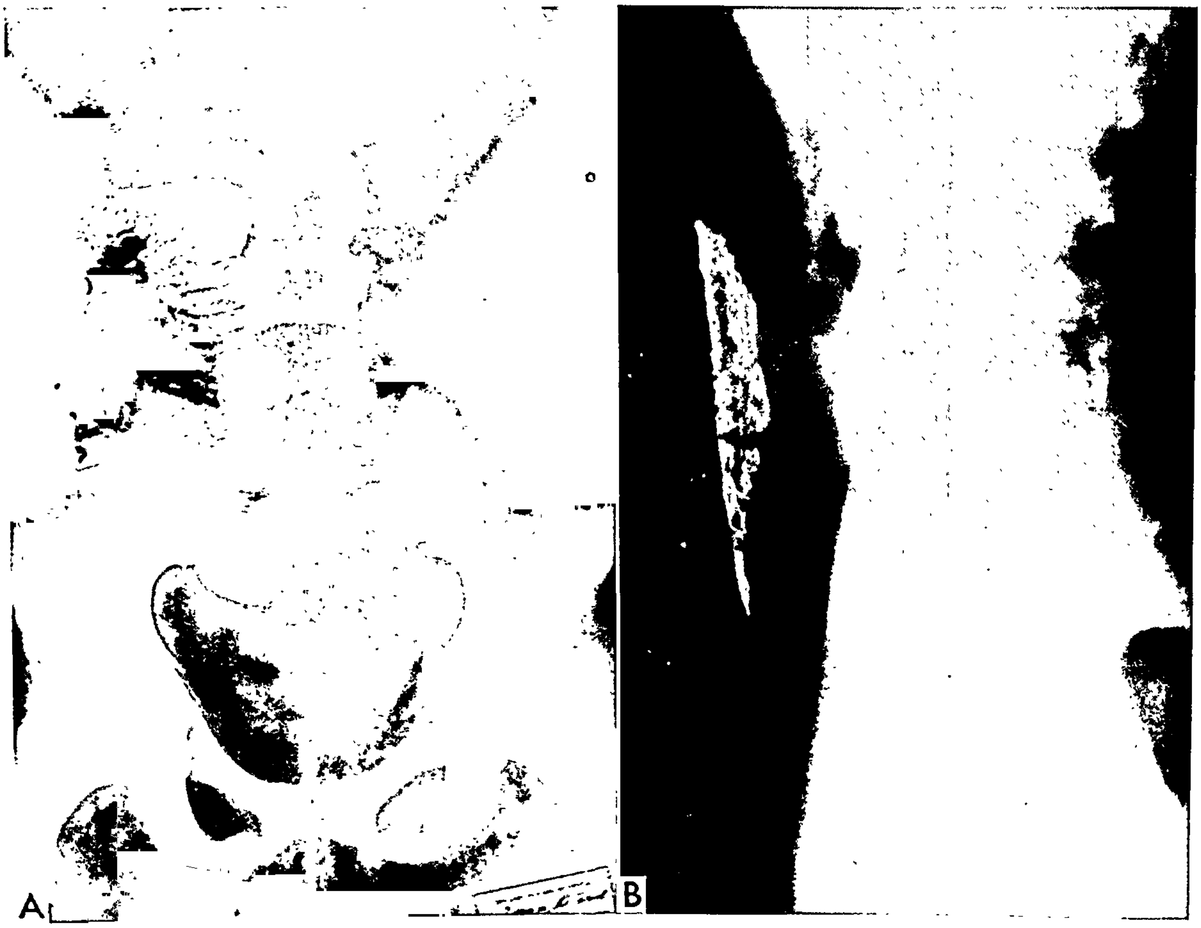


Fig. 2.—*A*, gauze becoming fragmented but still in place at thirty-six months. *B*, lateral view showing general thickness of repair.

after the operation. We do not condemn the use of hemostatic agents, but if catgut sutures are to be used for the repair it is unwise to add them.

During the last few years we have discussed the subject of tantalum gauze hernia repairs with a number of different colleagues. Many of them have never used it, because they were unfamiliar with nonabsorbable suture technics. It is hoped that this paper may give some assistance to these men, and we have adopted some definite standard technics in our own work.

1. The use of No. 0 chromic catgut around the edges of the gauze, tied with two knots with enough tension to keep the gauze taut, has been satisfactory in our hands.
2. A center line of sutures is added when possible.
3. We no longer fold the edges of the gauze.
4. Hemostatic agents are not placed over the gauze.
5. Whenever possible the gauze is placed under muscle or fascia.
6. Small rubber tissue drains are used for dependent drainage in obese patients.

Follow-Up of Fifty-Two Cases

Type of Hernia	*No. of Cases*	*Deaths*	*Recurrence*
Incisional	27	1	1
Inguinal (primary and recurrent)	22		
Cystocele	1		
Umbilical	1		
Meningocele	1	1	
	52	2	1

Nine patients did not report for follow-up, so our information is not complete; however, the number of successful repairs would seem to justify the method used, especially since one only adds the gauze in those cases in which one fears recurrence.

Since June 1954 another group of hernias has been repaired with stainless steel mesh gauze. Thus far, in 10 to 15 repairs, our results have been uniformly good. One death, however, followed an extensive bowel resection and repair of a large incisional hernia. The death was probably caused by an acute coronary attack.

ZUSAMMENFASSUNG

Die Verfasser geben einen Überblick über die Ergebnisse von 52 Bruchoperationen. Da neun Kranke nicht zur Nachuntersuchung erschienen, ist der Bericht nicht vollständig. Die Verfasser glauben aber, dass die Zahl der erfolgreichen Operationen ihre Methode rechtfertigt, besonders da die Verwendung der Gaze nur in solchen Fällen herangezogen wird, wo Gründe bestehen, einen Rückfall zu befürchten.

Seit Juni 1955 ist eine andere Gruppe von Kranken mit Brüchen unter Verwendung von Gaze aus nicht rostendem Stahlgewebe operiert worden. Die Erfolge waren bis jetzt in zehn oder fünfzehn Operationen gleichmässig gut. Ein Todesfall war nach umfangreicher Darmresektion und Reparatur einer grossen Einschnittshernie zu verzeichnen. Der Tod war wahrscheinlich durch einen akuten Kranzschlagaderanfall bedingt.

RIASSUNTO

L'autore riassume i risultati della cura di 53 ernie. Dei pazienti 8 non si presentarono al controllo, sichhè l'indagine non è completa; tuttavia, in base al numero dei successi ottenuti, egli ritiene che il metodo sia buono specialmente per il fatto che le garze metalliche vengono impiegate soltanto quando vi sia il timore della recidiva.

Dal giugno del 1954 un altro gruppo di ernie è stato curato con impianto di garze di acciaio inossidabile; i risultati sono stati buoni. Si è avuto un caso di morte in seguito ad un'ampia resezione di intestino e plastica di un grande laparocele postoperatorio. La morte è stata probabil-

mente causata da un attacco coronarico acuto.

RÉSUMÉ

L'auteur resume les résultats de 52 opérations reparatrices d'hernies Neuf patients ne retournèrent oas pour réexamination, de sorte que l'information des auteurs n'est pas complète. Tout de même à leur opinion le numéro de bons succèss opératifs justifie la méthode, spécialement dans les cas, ou on a peur d'un récidive.

Depuis le mois de Juin 1954 un autre groupe de hernies fut réparé avec de la gaze d'un filet de fil de fer non oxydable. Jusqu'à présent les résultats chez 10 ou 15 opérés etaient également bons. Il y avait un incident mortel après une résection intestinale extensive d'une large hernie ventrale. Probablement la cause de la mort était une attaque coronaire aigue.

BIBLIOGRAPHY

Crile, G. Jr., and King, D. E.: Successful Use of Tantalum Mesh to Repair Abdominal Wall Defect in Presence of Massive Fecal Contamination, Surgery 29:914-916 (June) 1951.

Iason, A. H.: Tantalum Gauze in Hernial Surgery, N. Y. State J. Med. 54:11:1621-1624 (June 1) 1954.

Throckmorton, T. D.: Tantalum Gauze in Repair of Hernias Complicated by Tissue Deficiency: Preliminary Report, Surgery 23:32-46 (Jan.) 1948. Repair of Obturator Hernia with Tantalum Gauze Implant, ibid. 27:888-892 (June) 1950.

Koontz, A. R., and Kimberly, R. C.: Tissue Reactions to Tantalum Mesh and Wire, Ann. Surg. 131:666-686 (May) 1950. Koontz, A. R.: Tantalum Mesh in Inguinal Hernia Repair, Surg., Gynec. & Obst. 92:101-104 (Jan.) 1951.

◆

The whole community may be considered as though it were a single laboring unit, with ten thousand different tasks distributed among its members, all linked together into the one common task which we call civilization. Looking at labor in that synoptic manner, one may say, in homely language, that society has only one job to offer to its members. The name of it is civilization, or, if you prefer, progress. We may be farmers or statesmen, carpenters or surgeons, stokers or artists, teachers, lawyers, shopkeepers, clergymen—what you will; but these vocations are only the different names we have for our different contributions to the one task we all share in common, that of carrying forward the work of civilization, which is the work of the ages, and which some call the Kingdom of God.

—*Jacks*

Cardiovascular Surgery

Practical Problems in Surgical Treatment of Mitral Stenosis

W. R. RUMEL, M.D., F.A.C.S., A.C.C.P., P. R. CUTLER, M.D.
AND
J. D. MORTENSEN, M.D.
SALT LAKE CITY, UTAH

DURING the past few years tremendous strides have been made in the surgical treatment of rheumatic mitral stenosis. Much has been learned about the selection of suitable cases, the surgical physiologic and pathologic factors, the management of technical problems and the results obtained. This experience has demonstrated beyond doubt that the state of health of many victims of this serious disease has been improved greatly and that many others have been spared from certain death. This experience has also shown that a significant number of persons have failed to obtain the result hoped for because of a number of somewhat complex reasons. The reported operative mortality rates, as well as the rates of improvement, have varied considerably in the literature. Indeed, some figures,[1] when observed casually, would cast doubt on the advisability of recommending the operation, because of high operative mortality rates and low rates of improvement. Such reports recently have resulted in increasing confusion and skepticism with regard to the true value of mitral commissurotomy. Physicians and surgeons should therefore attempt to clarify the problem by a critical analysis in order that they may fulfil their moral obligation to patients suffering from this disease. Certainly it would be dereliction of duty if one failed to recommend a relatively safe procedure which would improve a given patient's health or actually save his life. On the other hand, if those benefits could not be obtained without undue risk, the surgeon would be doing wrong by recommending the operation.

This presentation is the result of our efforts to clarify the situation on the basis of a review of the literature and a study of the results obtained in our personal series of 150 patients. Emphasis has been placed on analyzing the causes of poor results and of postoperative fatalities, particularly those cases which are potentially controllable, either partially or completely, by adequate management on the part of the medical and surgical team. Even casual observation shows that many factors are involved in guiding a patient successfully through this surgical procedure. These can be separated into subdivisions: selection of cases, preoperative preparation, technical management and postoperative care. Since consideration of all of these factors would be impossible in this short presentation, we concluded that a study of the patients who died and those

---

From the Division of Thoracic and Cardiovascular Surgery of The Latter-day Saints Hospital, Salt Lake City.

Read at the Twentieth Annual Congress of the United States and Canadian Sections, International College of Surgeons, Philadelphia, Sept. 12-15, 1955.
Submitted for publication Sept. 19, 1955.

whose condition became worse would be most apt to provide information that would be helpful in improving the end results of the operation.

Analysis of Cases.—Since the first operation, which was done on May 17, 1951, 152 operations have been performed on 150 patients (2 reoperated on for recurrent stenosis). Nine patients were excluded from further study because, for various reasons, they did not actually undergo mitral commissurotomy.

In 1 case the operation was performed mainly for the purpose of stopping recurrent embolization from atrial thrombi, but also with the hope that significant stenosis might be associated with the obvious mitral insufficiency. However, significant stenosis was not present.

Commissurotomy was not performed in the second case because the left atrium was so extensively thrombosed that it was not possible to enter the chamber through the appendage or the atrial wall. An attempt to enter through the pulmonary vein caused serious hemorrhage from an inaccessible laceration, which made further efforts inadvisable.

In the remaining 7 cases mitral insufficiency was readily recognized, but its relative degree was miscalculated. In all of these there was gross mitral insufficiency without significant stenosis; therefore, commissurotomy was not done.

The causes of death in the 143 operations are given in Table 1. Since causes 1, 3 and 4 are of greater practical importance because they are potentially preventable, they alone will be discussed.

Traumatic (Surgical) Mitral Insufficiency. — In this phase of the study the results attained with various technics, correlated with pathologic changes present, were evaluated for each individual commissure (Table 2). Thus, 192 commissures were attacked during 143 operations on 141 patients. In 112 commissurotomies mitral insufficiency was not produced or increased by the operation. In 59 instances an insignificant increase occurred, being estimated at 4 cc. per beat or less. None of the patients in this group failed to improve. In 21 commissurotomies a greater degree of insufficiency was produced, being estimated at 5 cc. or more per beat. This group was subdivided into

TABLE 1.—*Causes of Death from Mitral Commissurotomy*
(19 Deaths Following 143 Operations)

Cause of Death	*Postoperative*	*Late*	*Total*
1. Traumatic (surgical) mitral insufficiency	2	2	4
2. Complications referable to the central nervous system	2	2	4
3. Acute hypotension with myocardial ischemia and failure	4	0	4
4. Recurrence of mitral stenosis	0	1	1
5. Miscellaneous			
Quinidine toxicity	1	0	1
Obstruction of the small bowel	0	1	1
"Heart attack"—no autopsy	0	1	1
Mitral insufficiency—failure	0	1	1
Electric shock therapy	0	1	1
Psychosis with complications	0	1	1
Totals	9 (6.3%)	10 (7.0%)	19 (13.3%)

TABLE 2.—*Technical Details in 192 Commissurotomies (143 Operations)*

Method	*Without Production of Mitral Insufficiency*		*With Production or Increase of Mitral Insufficiency*						*Totals*
			Insignificant Change 4 cc. or Less		*Significant Change* — *Patients Same or Improved*		*More Than 4 cc.* — *Patients Worse or Dead*		
	Good Valves	*Bad Valves*	*Good Valves*	*Bad Valves*	*Good Valves*	*Bad Valves*	*Good Valves*	*Bad Valves*	
Finger fracture	AL 41 PM 16 57	AL 16 PM 4 20	AL 25 PM 11 36	AL 1 PM 1 2	AL 2 PM 0 2	AL 1 PM 0 1	AL 1 PM 0 1	AL 0 PM 0 0	AL 87 PM 32 119
Hook guillotine	AL 9 PM 2 11	AL 3 PM 1 4	AL 5 PM 0 5	AL 1 PM 0 1	AL 3 PM 1 4	AL 0 PM 0 0	AL 4 PM 2 6	AL 1 PM 2 3	AL 26 PM 8 34
Downward cutting knife	AL 9 PM 3 12	AL 1 PM 3 4	AL 7 PM 8 15	AL 0 PM 0 0	AL 1 PM 0 1	AL 1 PM 2 3	AL 0 PM 0 0	AL 0 PM 0 0	AL 19 PM 16 35
Other instruments	AL 2 PM 1 3	AL 1 PM 0 1	AL 0 PM 0 0	AL 0 PM 0 0	AL 0 PM 0 0	AL 0 PM 0 0	AL 0 PM 0 0	AL 0 PM 0 0	AL 3 PM 1 4
Totals	AL 61 PM 22 83	AL 21 PM 8 29	AL 37 PM 19 56	AL 2 PM 1 3	AL 6 PM 1 7	AL 2 PM 2 4	AL 5 PM 2 7	AL 1 PM 2 3	AL135 PM 57 192

AL = Anterolateral Commissure
PM = Posteromedial Commissure
For definition of good and bad valves, see text.

11 with lesser degrees of insufficiency, the patient's response varying from no change to a very significant improvement (none became worse) and 10 with greater degrees of insufficiency, all of whom are worse or dead.

Evaluation of the methods of commissurotomy gave specific support to impressions we have had for some time with regard to the relative safety of digital and instrumental commissurotomy, particularly the danger *in our hands* of using a hook guillotine type of valvulotome (Table 3).

In 19.2 per cent of the anterolateral and 50 per cent of the posteromedial commissures opened with a hook guillotine type of knife, the degree of insufficiency produced was such that the patients fell into the category of "worse or dead." With digital commissurotomy a similar serious degree of mitral insufficiency was produced in 1.1 per cent of the anterolateral commissurotomies and none of the posteromedial. With the downward-cutting knife the production of such a degree of insufficiency did not occur at all. The data support the statement[2] that serious leakage is more apt to follow *surgical* attack on the posteromedial commissure than on the anterolateral. In spite of this, it was interesting to note that in 2 of the 3 patients who died of surgically produced *mitral insufficiency the anterolateral commissure* only was opened with a hook guillotine knife.

The difference in the results obtained with the hook guillotine and the downward-cutting knife were not to be explained on the basis of the commissure attacked, since in 34 commissurotomies performed with the hook guillotine the anterolateral commissure was divided 26 times and the posteromedial 8 times. In 35 commissurotomies performed with the downward-cutting knife the anterolateral commissure was cut on 19 occasions and the posteromedial on 16 (Table 3).

TABLE 3.—*Traumatic (Surgical) Mitral Insufficiency; Patients Worse or Dead; 188 Commissurotomies*

Technic and Number	*Anterolateral* %	*Posteromedial* %
Finger fracture 119	1.1	0
Downward-cutting knife 35	0	0
Hook guillotine 34	19.2	50

In order to determine the relation between the production of mitral insufficiency and the type of pathologic change that was present, the valves were arbitrarily divided into "good" valves and "bad" valves. Good valves were those with minimal calcification, or none, and good flexibility of the leaflets, although the fibrous thickening of the stenotic ring frequently was extremely tough, requiring instrumental division. Bad valves were those which showed gross calcification, frequently with large irregular masses, and a moderate to marked degree of thickening of the leaflets generally that dereased their mobility to a significant deree. The incidence of production of serious mitral insufficiency in the group of bad valves was significantly greater than it was in the group of good valves (Table 2), as has been reported by others.[3] Nevertheless, in the vast majority (32 out of 39) classed as bad valves, it was possible to open the commissures without producing or increasing preexisting insufficiency to a significant degree.

Essentials of Safe Commissurotomy.—As surgical incision of the commissures of the mitral valve is strictly a technical mechanical problem that one should be able to master with proper instruments and experience, surgeons should be able to improve their results by a better understanding of the mechanics involved when correlated with the anatomic and pathologic changes. In performing mitral commissurotomy without producing mitral insufficiency, two points are absolutely essential: (1) the chordae tendineae must not be injured, and (2) the leaflets must not be damaged (Fig. 1*A*).

1. *Avoidance of Injury to the Chordae Tendineae:* The mitral valve might be considered as a bivalvular structure whose leaflets, in the closed position, lie roughly in a plane perpendicular to the attached chordae tendineae. The chordae are roughly parallel to one another as they approximate in the closed position. Therefore, if a cutting instrument is inserted deep to the plane of the valve it will not injure the chordae *if* it is parallel to them, which also means that its axis is essentially at right angles to the plane of the valve (Fig. 1*B*). Any angulation away from this safe axis will increase the likelihood of chordal injury, with resultant leakage in direct proportion to the increase of the angle (Fig. 1*C*). Any instrument used in cutting the commissure from the atrial surface downward is intrinsically less apt to injure the chordae than are instruments which cut sidewise or from below upward. This is true because even if the axis of the instrument should be angulated away from the safe axis, an injury to the chordae is relatively unlikely, since the downward pressure forces the leaflets downward, making the chordae lax and buckled and therefore much less vulnerable to damage (Fig. 1*D*). The passage of any type of hook-shaped instrument through the mitral valve is particularly likely to catch the chordae, owing to slight degrees of rotation and/or angulation of the hook that cannot be avoided in a moving heart (Fig. 2*D*). The more nu-

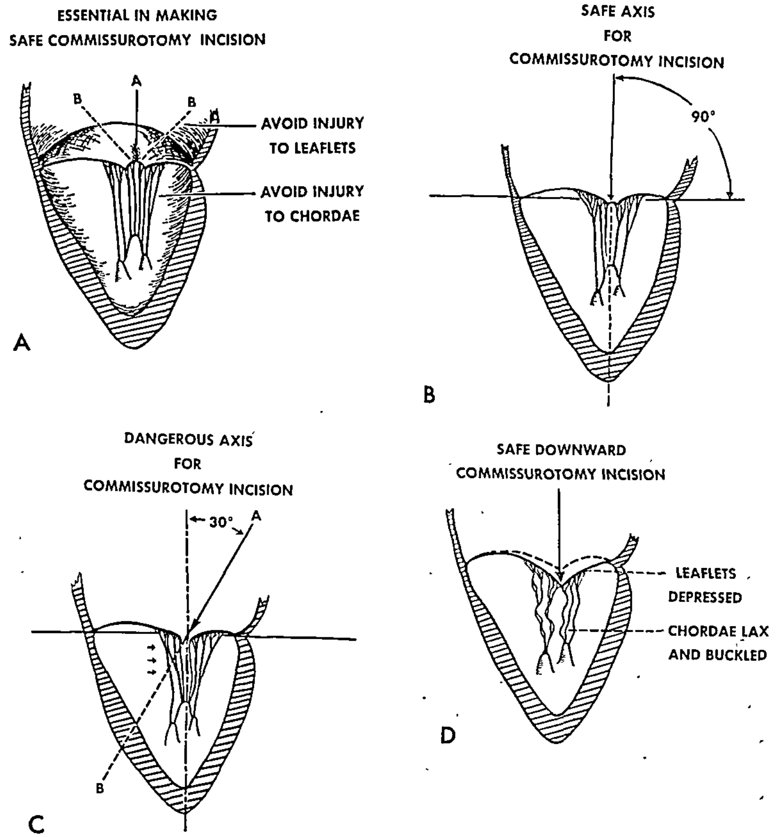

ESSENTIAL IN MAKING SAFE COMMISSUROTOMY INCISION
A
B
B
B'
AVOID INJURY TO LEAFLETS
AVOID INJURY TO CHORDAE
A
SAFE AXIS FOR COMMISSUROTOMY INCISION
90°
B
DANGEROUS AXIS FOR COMMISSUROTOMY INCISION
30°
A
B'
C
SAFE DOWNWARD COMMISSUROTOMY INCISION
LEAFLETS DEPRESSED
CHORDAE LAX AND BUCKLED
D

Fig. 1.—*A*, sketch demonstrating that safe commissurotomy must separate leaflets precisely in the commissure (*A*). Incision at some other point, such as *B* or *B'*, produces significant insufficiency. *B*, incision in the commissure perpendicular to the plane of the valve and parallel to the chordae. This is safe. *C*, incisions away from the safe axis which favor serious chordal division. See arrows. *D*, downward commissurotomy incision depresses the leaflets, relaxes the chordae and minimizes the tendency toward chordal injury.

merous the chordae—that is, the less the fusion due to disease—the greater the likelihood of catching and dividing one or more of these important guy wires. As chordal fusion increases, owing to advancement of the pathologic process,[5] the tendency to catch the chordae decreases. Still, if any of the larger aggregations of fused chordae should be divided, the degree of insufficiency will be correspondingly greater.

Since it is difficult to visualize adequately some of these mechanical problems, a plastic model was created with an excised mitral valve sutured into place in such a manner as to illustrate more or less accurately the geometric problems as they exist in life with the patient in the standard posterolateral position (Fig. 2*A*). The photographs of the model depict the entrance through the auricular appendage as a relatively fixed point, as it is in the actual operation, owing to the small arc that can be traversed by displacement of the atrial wall as well as to the limitation imposed by the unyielding intercostal incision. As a result of the relative fixation of the atrial entrance, no instrument with a simple curve in one plane can be manipulated into the safe axis of commissural division as here defined. This is relatively applicable to the anterolateral commissure and still more applicable to the posteromedial (Fig. 2*B*). In order to attain a safe axis, the point of entrance into the atrium would have to be rotated downward some 60 degrees (Fig. 2*C*). The mechanism of catching the chordae in a hook type of

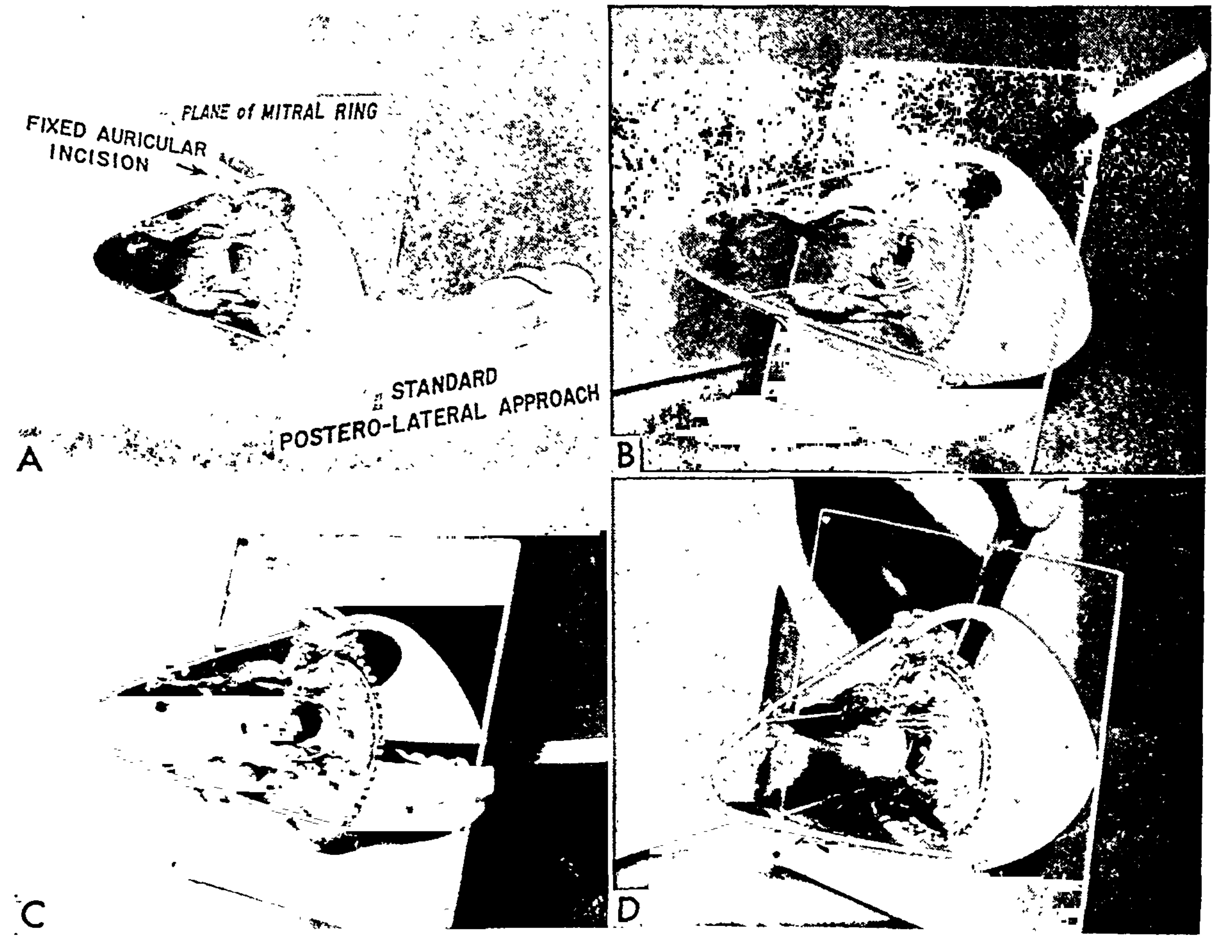


Fig. 2.—*A*, normal mitral valve sutured into plastic model in essentially correct geometric relations. The point of entrance through the auricular appendage is relatively fixed. *B*, the same, showing a dangerous cutting angle. The instrument used is a simple curved valvulotome. *C*, same instrument in safe cutting position (impossible through routine auricular incision). *D*, the same, showing the chordae caught by a valvulotome of the hook type.

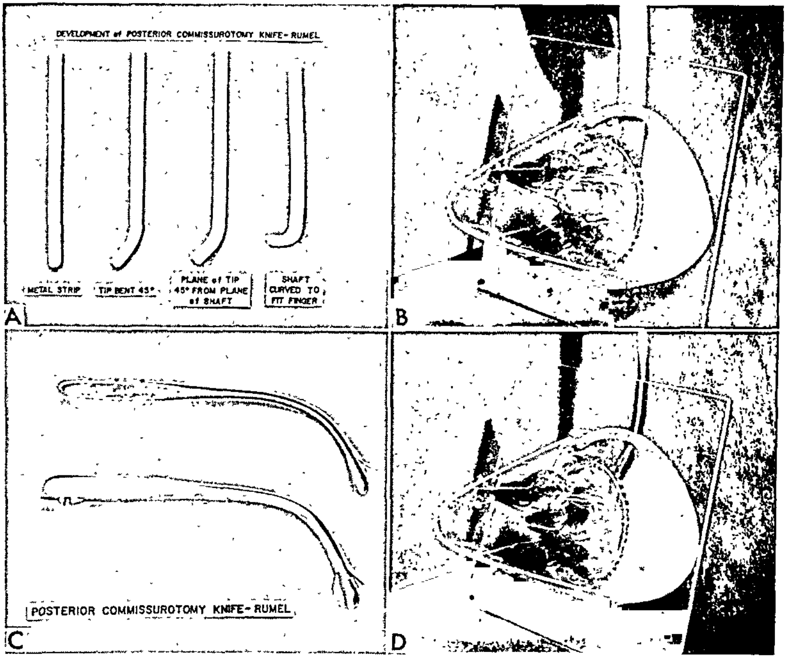

DEVELOPMENT of POSTERIOR COMMISSUROTOMY KNIFE - RUMEL
METAL STRIP
TIP BENT 45°
PLANE of TIP 45° FROM PLANE of SHAFT
SHAFT CURVED TO FIT FINGER
A
B
POSTERIOR COMMISSUROTOMY KNIFE - RUMEL
C
D

Fig. 3.—*A*, development of posterior commissurotomy knife. Beginning with a simple flat metal strip, the distal end is first bent 45 degrees or somewhat more. Next, the plane of the distal end is twisted clockwise some 45 degrees. Finally, the shaft is curved moderately to fit the curve of the finger within the atrium; thus the tip is aligned to the safe axis of commissurotomy. *B*, final strip through fixed atrial entrance, with tip in safe axis for commissurotomy. *C*, photograph demonstrating that these instruments embody the angulations described under *A* and also the expandable guide that forces the cutting blade accurately into the opposite commissure. *D*, knife in safe axis for commissurotomy.

guillotine because of rotation of the plane of the tip of the instrument is well shown (Fig. 2*D*).

2. *Avoidance of Injury to Valve Leaflets:* Any incision into the substance of the valvular leaflets, particularly the aortic, will cause leakage of the valve varying from an amount producing no significant clinical effect to an amount causing a fatal outcome in a very short time. It is imperative, therefore, that the commissural incision be made precisely in the line of fusion of the leaflets if insufficiency is to be avoided (Fig. 1*A*). The accurate placement of a cutting instrument in either end of an elliptic opening should be a simple problem. The probability of entanglement of the tip of the instrument in the subjacent chordae, however, makes the problem more complex. In actual practice, gross errors in the placement of the incision have occurred. The tendency toward such entanglement can be minimized by making the distal end of the instrument broad

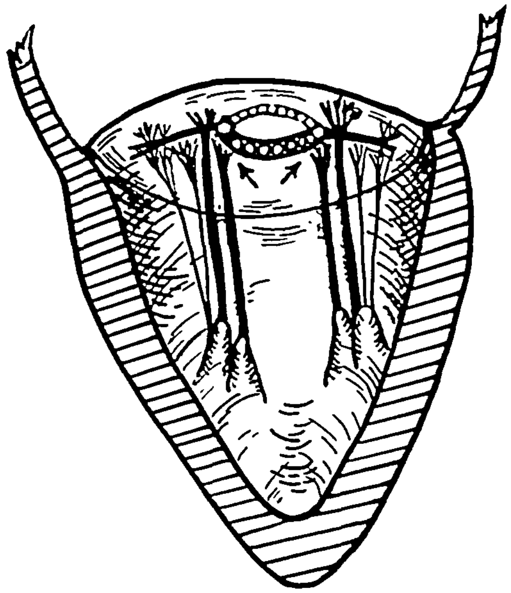


Fig. 4.—Ventricular surface of valve, showing firm fibrous ring of tight mitral stenosis limited at points of "critical attachment of chordae" (see arrows). The ideal commissurotomy *must* divide both ends of the ring and separate completely both commissures.

blunt rather than thin and sharp or hooked.

Individual surgeons have their preferences with regard to instruments and become adept at using the one or two of their choice. It would be foolish to state that a given surgeon could not attain sufficient skill by practice with a given instrument to carry out safe and satisfactory commissurotomy. It would be equally foolish to state that the aforementioned fundamental facts can be overlooked by the average surgeon without unnecessarily increasing the danger of the operation. With these thoughts in mind, we have developed downward-cutting knives which, in our opinion, more nearly satisfy the fundamental requirements that make for safe commissurotomy (Fig. 3).

The knife shown in *A*, Figure 3, will make an incision perpendicular to the plane of the valve and parallel to the chordae as a result of the double curve of the shank. In *B*, an expanding guide in one commissure adjusts the blunt probe point accurately into the opposite commissure, thus allowing the incision to be made at the proper point. With the knife shown in *C* the cut is made from above downward, which minimizes the danger of chordal injury.

Our experience with this instrument convinces us that we can obtain considerably better results in the future than we have in the past, particularly when the valves are good. With bad valves and a funnel-shaped orifice there is a tendency for the downward-cutting knife to slip off the commissure without making an incision. In such cases one of the side-cutting knives or a hook guillotine may be required.

Recurrent Mitral Stenosis.—Since our first operation was done (on May 17, 1951) there have been 3 cases of recurrent mitral stenosis and 1 additional case in which the course is suggestive but not clear cut. In all 3 cases the opening attained was definitely inadequate or a surgical compromise. In the first case the valve was bad, with extreme calcification and diffuse thickening throughout, making adequate mobilization impossible. In addition, only the anterolateral commissure was opened. Furthermore, unquestioned evidence of recurrent active rheumatic infection developed in the patient, who died rather suddenly a few days before his scheduled reoperation. The second patient had a good valve, but only the anterolateral commissure was opened—and that incompletely—so that the opening achieved was snug around the distal interphalanged point, or approximately 1.8 cm. long. Definite recurrence developed, making reoperation necessary twenty months later. The third patient also had a good valve, but the anterolateral commissure alone was only partially opened, so that the orifice too was snug around the distal joint. Again stenosis recurred, requiring a second operation twenty months later.

In all of these cases the operations were inadequate or compromise commissurotomies according to our present standards. This experience coupled with reports of a few cases[6] that have appeared in the medical literature, remove the question as to whether or not mitral stenosis recurs. The more important question as to the frequency of recurrence, however, will not be fully answered for some years to come.

Pathologic Changes Related to Recurrent Stenosis: As a result of the rheumatic process, fusion of the mitral leaflets occurs from each extremity toward the center and, according to Brock,[7] most markedly in the regions of the "critical points of attachment" of the major chordae tendineae, bringing about a more or less uniform size of the narrowed orifice. Although further narrowing may occur, these points of critical attachment constitute a point of firm fibrous union which frequently is easy to reach during commissurotomy but difficult to break or cut completely through on either end. This fibrous ring produces obstruction as well as decreased mobility of the leaflets, even though they may be normally thin and flexible peripheral to the scarred annulus (Fig. 4).

Another important pathologic change is a progressive deposition of scar tissue, with or without calcification, onto both leaflets. This brings about progressive thickening and progressive decrease in valvular flexibility and mobility. The less the total mobility of the leaflets, the less satisfactory will be the relief of obstruction through commissurotomy and the greater will be the tendency to refusion of the leaflets along the line at which they were divided. This must be true for the same reason that excessive motion at the site of a healing fracture or of an incised wound minimizes the healing tendency, while immobilization favors healing. As the flexibility and mobility of the leaflets decrease, the need for complete division of the fibrous ring and *complete* separation of the fused leaflets in both commissures increases.

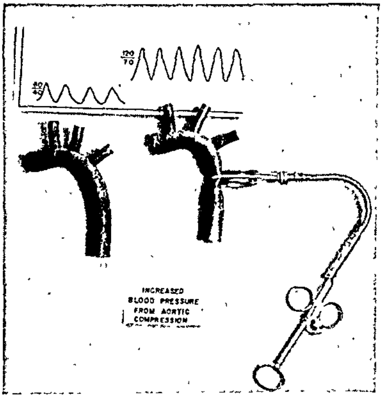


Fig. 5.—Reproduction of intra-arterial pressure curves, showing increased blood pressure resulting from aortic compression.

If one hopes to attain the maximal degree of improvement in valvular function, one's goal must be complete division of the fibrous ring with accurate extension in *both* directions until the fused leaflets are separated to the point where the commissures normally terminate, which is close to the atrioventricular junction. Anything short of this ideal is a surgical compromise, even though such a compromise may be justified. In our series of 143 operations, compromises were accepted in the majority of cases, especially early in our experience, as is indicated by the fact that the anterolateral commissure alone was opened in 60.8 per cent, the posteromedial alone in 4.1 per cent and both commissures in 35.1 per cent. The figures of surgeons with much greater experience are similar, according to reports from the Bailey Thoracic Clinic.[2] Here the anterolateral commissure alone was opened in 65 per cent, the posteromedial in 1.9 per cent and both in 33.2 per cent of cases. Actually, it is rather surprising and perhaps encouraging that stenosis has not recurred much more frequently than it has, in view of the frequency of such compromise operations.

The expectation that stenosis of many surgically treated valves will recur over a period of time equivalent to that normally required for the stenosis to develop initially, as indicated by Wood,[3] is impossible to evaluate, particularly if widespread prophylactic chemotherapy and antibiotic therapy are carried out postoperatively. There seems to be no basic reason, however, to doubt that the frequency of recurrence will be less among patients in whom the ideal of maximal valvular flexibility and mobility is attained by the operation. If a compromise or an inadequate result is obtained, whether due to advanced pathologic changes or to incomplete opening of one or both commissures, the rate of recurrence must be expected to be higher.

All who have had significant experience with mitral commissurotomy have been faced with situations that would justify a compromise short of the ideal surgical result. By all odds the most important deterring factor is the possibility of producing or increasing mitral insufficiency. If insufficiency has been produced in either commissure, further efforts in such an area cannot be pursued safely without serious risk to the patient. The potential danger of producing insufficiency, particularly in the posterior commissure, is well known, especially if instrumentation proves necessary. Frequently, therefore, if a reasonably good commissurotomy has been attained anteriorly one may accept a compromise opening, because of the fear of producing posterior leakage, even though it may be fully recognized that recurrent stenosis is much more apt to appear at a later date. The obligation of surgeons seems very clear. They must strive to improve their technical attainments, so that the surgical ideal will be the rule and the compromise the exception, and this must be done without significant risk to the patient. Each surgeon must determine which methods will enable him to attain this goal most consistently.

With regard to the technic of commissurotomy, our experience in opening 192 commissures has been rather similar to that of others. It was possible to use finger fracture in 119 instances, with production of serious or fatal insufficiency on one occasion — due to excessive force, which produced a tear into the aortic leaflet. In the remaining 73 instrumentation was necessary.

Acute Hypotension with Myocardial Ischemia and Failure. — In studying the causes of death during or shortly after mitral commissurotomy one often encounters such terms as "cardiac arrest," "cardiac failure," "postoperative hypotension," "protracted hypotension," "ventricular fibrillation," "myocardial insufficiency," "failure to awaken—died in shock," "uremia," "cerebral anoxia," "renal failure," etc. A review of 4 of our fatal cases—in 3 of which the patient died on the operating table and in 1 of which death occurred seventy-two hours later — has suggested the likelihood that acute hypotension with myocardial ischemia and failure may be a common precipitating cause of the deaths reported in this heterogeneous group. Certainly acute hypotension and myocardial ischemia may produce tissue anoxia and concomitant tissue electrolyte disturbances in the myocardium and other organs, notably the central nervous system. These changes further aggravate the hypotension, which in turn increases the anoxia attached to of the myocardium and the central nervous system. If the vicious circle is not broken by removing the initiating cause, then cardiac arrest or ventricular fibrillation may follow. A fatal termination at this point could properly be ascribed to "cardiac arrest," "cardiac failure," "ventricular fibrillation," "myocardial insufficiency," etc. Even if resuscitative measures are successful, the damage to the cardiovascular and nervous systems is frequently of such degree that hypotension may persist for a number of hours, producing fatal "renal failure" or "uremia." In patients who have had pulmonary edema preoperatively the damage to the alveolar membrane resulting from additional acute hypoxia may well be sufficient to precipitate postoperative pulmonary edema even though the mitral obstruction has been relieved. In this event the cause of death may be listed as "pulmonary edema," but the basic initiating cause was the acute hypotension, with myocardial ischemia and failure.

From a practical standpoint, in our experience, two procedures are of the utmost importance in setting the vicious circle into motion. The first is digital or instrumental obstruction of the stenotic mitral orifice. Such obstruction, if complete, prevents the filling of the left ventricle and promptly causes hypotension in the coronary and cerebral arteries. The second factor is rapid loss of blood from the atrium, whether it is accidental or planned[8] in order to "flush out" clots from the atrium.

Tolerance of acute hypotension, with its resultant vicious circle of serious complications, varies greatly in individual patients and is most certainly decreased by many factors, the most important being advanced age, cardiomegaly, coronary sclerosis, renal impairment, generalized hypoxia resulting from sedation or anesthetic drugs, anemia, pulmonary edema and preexisting damage to the central nervous system.

In order to avoid the serious consequences that follow acute hypotension during a mitral operation, certain practices, in our opinion, are of definite help. It goes without saying that all general factors, such as correction of anemia, avoidance of anoxia, optimal management of renal problems, etc., should be carried out. In addition, during the operation, before one manipulates or obstructs the mitral valve, the following factors should be considered and managed properly: 1. Oxygenation of the blood should be brought to a maximal level by allowing full expansion and ventilation of the lungs by the anesthesiologists. 2. Before proceeding, if hypotension is present, a suitable vasopressor, such as neosynephrine or methoxamine hydrochloride, should be used to reestablish a normal or near-normal pressure. 3. Manipulations producing obstruction of the mitral orifice should be as brief and infrequent as possible. 4. If loss of blood is anticipated, blood for replacement should be immediately available and used as rapidly as the loss occurs. 5. Care should be exercised to avoid compression or angulation of the left coronary artery,[9] which may produce hypotension and ischemia. 6. According to our initial impression, brief aortic compression, which has been used in a few instances, may well be life-saving if applied immediately during rapid loss of blood to maintain the central aortic pressure head until the blood is replaced and compensatory mechanisms come into play. We have satisfied ourselves of the efficiency of aortic compression distal to the left subclavian artery in elevating a shock level pressure to an adequate pressure by routine cuff measurements as well as by direct intra-arterial recordings (Fig. 5). If, before the intracardiac manipulations are begun, a wide tape is placed around the aorta and a flexible Rumel tourniquet with a specially adapted atraumatic flat compressing surface, the aorta can be compressed at any moment without retraction of the lung or interference with the operative procedure in any way. This procedure has proved useful in cardiac resuscitation, although occlusion of the aorta for more than a few minutes at a time must be carefully avoided.

CONCLUSIONS

1. In a significant number of cases the causes of poor results or death following mitral commissurotomy are avoidable or correctable, either partially or completely.
2. The production or increase in preexisting mitral insufficiency can be minimized by observing certain mechanical and technical precautions as they relate to the anatomic structure and pathologic changes in the mitral valve.
3. A comparison of the results obtained from commissurotomy by different technics indicates that in the authors' hands the use of hook guillotine valvulotomes is less safe than other methods. Their experience with a new, safer, downward-cutting valvulotome is described.
4. Recurrent mitral stenosis, in all probability, can be made less frequent by the complete opening of both commissures, which should be possible much more frequently if improvements in technic are developed.
5. Acute hypotension with myocardial ischemia and failure is probably the initiating cause of many operative and postoperative deaths commonly attributed in the medical literature to such causes as "cardiac arrest," "cardiac failure," "myocardial insufficiency," "ventricular fibrillation," "postoperative hypotension," "uremia," "protracted hypotension," "renal failure," "anoxia cerebral," etc. Methods of avoiding these deaths are suggested.

RIASSUNTO

1. In un gran numero di casi la causa della morte o di un insucesso dopo commissurotomia della mitrale può essere evitata o ridotta.
2. L'insorgenza o l'aggravamento dell'eventuale insufficienza valvolare può essere evitata o ridotta al minimo mediante alcune precauzioni di carattere tecnico.
3. Il confronto dei risultati ottenuti dalla commissurotomia eseguita con tecniche diverse sembra indicare che l'uso dei commissurotomi a ghigliottina è meno sicuro. Viene descritto dagli autori un nuovo valvulotomo che nelle loro mani ha dato risultati migliori.
4. La recidiva può essere resa meno frequente dall'apertura completa di entrambe le commissure; questo è possibile grazie ai miglioramenti tecnici.
5. L'ipotensione acuta con ischemia miocardica e insufficienza cardiaca è probabilmente la causa iniziale della maggior parte dei casi di morte intra- o post-operatoria, che di solito viene invece attribuita ad altre cause, quali l'arresto cardiaco, l'insufficienza cardiaca, l'insufficienza miocardica, la fibrillazione ventricolare, l'ipertensione post-operatoria l'uremia, l'ipotensione prolungata, la insufficienza renale, l'anossia cerebrale etc. Vengono suggeriti alcuni sistemi per evitare questi casi di morte.

RÉSUMÉ

1. Dans un nombre assez grand de cas les causes d'un mauvais succès ou de la mort suivant une commissurotomie mitrale sont de telles, qu'ils peuven être évitées ou atténuées, soit partiellement, soit complètement.
2. Le développement d'une insuffisance mitrale ou de son aggravation en cas qu'elle préexistait, peut être atténué, si certaines precautions mécaniques et techniques, concernant la structure anato-

mique et les lésions pathologiques de la valve mitrale sont prises.

3. Une comparaison des résultats obtenus de commissurotomies différentes techniques indique, que dans les mains des auteurs l'usage des valvulotomes crochet-guillotine est plus dangereux que des autres méthodes. Leur expérience avec un nouveau valvulotome, moins dangereux, coupant du haut en bas, est décrite.

4. Le récidive de la sténose mitrales serait probablement moins fréquent, si on ouvrait les deux commissures complètement, ce qui sera possible plus souvent après du progrès technique sera développé.

5. L'hypotension aigue avec ischaemie et faiblesse myocardiaque eta probablement la cause principale de beaucoup de cas de mort opératives et postoperatives, qui dans la littérature médicale sont attribués à des causes telles que "arrêt cardiaque," "faiblesse cardiaque," "insuffisance myocardiaque," "fibrillation ventriculaire," "Hypertension postopérative," "uraemie," "Hypotension trainante," "insuffisance rénale," "anoxie cérébrale" etc. On recommende des méthodes pour eviter ces causes de mort.

ZUSAMMENFASSUNG

1. Die Ursachen schlechter Resultate oder von Todesfällen nach Kommissurotomie der Mitralklappe lassen sich in einer erheblichen Anzahl von Fällen vermeiden oder völlig oder teilweise ausgleichen.

2. Die Schaffung einer Mitralinsuffizienz oder die Verstärkung einer bereits bestehenden lässt sich durch Beachtung gewisser zum anatomischen Bau und zu den krankhaften Veränderungen der Mitralklappe in Beziehung stehender mechanischer und technischer Vorsichtsmassnahmen auf ein Mindestmass herabsetzen.

3. Beim Vergleich der mit verschiedenen Techniken ausgeführten Kommissurotomien sich ergebenden Resultate findet der Verfasser, dass in seiner Hand die Anwendung des Haken-Guillotinen-Valvulotoms weniger Sicherheit bietet als andere Methoden. Er beschreibt seine Erfahrungen mit einem neuen, sichereren, nach unten schneidenden Valvulotoms.

4. Die Häufigkeit des Auftretens von Rückfällen der Mitralstenose lässt sich sehr wahrscheinlich durch eine völlige Eröffnung beider Kommissuren herabsetzen. Mit fortschreitender Verbesserung der Technik lässt sich aus voraussichtlich viel häufiger ausführen.

5. Die eigentliche Ursache, die vielen operativen und postoperativen Todesfällen zugrundeliegt, ist wahrscheinlich eine akute Herabsetzung des Blutdrucks mit Blutarmut und Versagen des Herzmuskels. In der Literatur werden solche Todesfälle gewöhnlich anderen Ursachen zugeschrieben, wie z. B. "Herzstillstand," "Herzschwäche," "Herzmuskelschwäche," "Kammerflimmern," "postoperativem Bluthochdruck," "Urämie," "langdauernder Blutdrucksenkung," "Niereninsuffizienz," "Sauerstoffarmut des Gehirns" usw. Es werden Vorschläge gemacht, wie solche Todesfälle sich vermeiden lassen.

REFERENCES

1. Ferrer, M. I.; Harvey, R. M.; Wylie, R. H.; Himmelstein, A.; Lambert, A.; Kuschner, M.; Cournand, A.; and Richards, D. W.: Circulatory Effects of Mitral Commissurotomy with Particular Reference to Selection of Patients for Surgery. Circulation 6:688, 1952. Soloff, L. A., and Zatuchni, J.: Some Difficulties in Evaluating Functional Results After Mitral Commissurotomy. J.A.M.A. 151:973, 1953.

2. Bailey, C. P.: Surgery of the Heart. Philadelphia: Lea & Febiger, 1955.

3. Wood, P.: Appreciation of Mitral Stenosis. Part II. Investigations and Results. Brit. M. J. 1:1113, 1954.

4. Wood, P.: Appreciation of Mitral Stenosis. Part I. Clinical Features. Brit. M. J. 1:1051, 1954.

5. Magarey, F. R.: Pathogenesis of Mitral Stenosis. Brit. M. J. 1:856, 1951.

6. Muller, W. H. Jr.: The Fate of the Incised Commissure in Mitral Stenosis. Surgery 37:1008, 1955. Jordan, P. Jr., and Hellems, H. K.: Mitral Valve Surgery. Grune & Stratton, 1955. Keyes, J. W., and Lam, C. R.: Recurrence of Mitral Stenosis Following Mitral Commissurotomy. J.A.M.A. 158:917, 1955. Glover, R. P.; Davila, J. C.; O'Neill, T. J.; and Janton, O. H.: Does

Mitral Stenosis Recur After Commissurotomy? Circulation 11:14, 1955. Bailey.[2] Wood.[3]

7. Brock, R. C.: The Surgical and Pathological Anatomy of the Mitral Valve, Brit. Heart J. 14: 489, 1952.

8. Jamison, W. L.; Rao, K. V. S., and Bailey, C. P.: A Maneuver for Extracting Clots from t
Atrium at the Time of Mitral Commissurotom
J. Thoraric Surg. 29:541, 1955.

9. Mudd, J. G.; Inkley, J. J., and Hanlon, C.
Myocardial Ischemia During Mitral Commissur
omy, Am. J. Med. 17:330, 1954.

Bursts of cholera occurred throughout the Victorian age like the irregular striking of a crazy clock, and this eldritch warning quickened the sense of urgency about health, and caused many laws to be passed under the stimulus of panic. We might almost say that Asiatic cholera was the secret ally of Edwin Chadwick. He warned the English people that unless they swallowed a dose of his sanitary medicine, the cholera would return, and behold it did return, and Chadwick had the power of a Black Magician. He knew nothing of microbes, or the deadly power of the cholera germ to thrive in water, in milk, or on infected vegetables, but he believed heartily that it was caused by "contagion," which was the result of filth . . . The cholera cast its huge shadow of panic. The Presbyterians of Edinburgh appealed to the Home Secretary to announce a general Religious Fast as a way of deflecting the Divine Vengeance. But the Home Secretary happened to be Lord Palmerston, and before issuing his reply to the Scottish Ministers, he consulted the Board of Health. . . . The answer was duly published, and shocked the Presbytery. For Palmerston bluntly rejected the idea of a National Religious Fast. He said that the maker of the universe had established certain natural laws, on the observance or neglect of which depended the weal or woe of mankind. The best course which the country could follow to prevent the cholera was to use the interval before the next epidemic to carry out measures to remove sources of contagion, which if allowed to remain will infallibly breed pestilence and be fruitful in death, in spite of all the prayers and fastings of a united but inactive nation. . . . When man has done his utmost for his own safety, then it is time to invoke the blessing of Heaven to give effect to his exertions.

—*Williams*

Treatment of Aneurysms with Dermal Grafts

ROBERT J. MEADE, M.D., F.A.C.S., D.A.B.
AND
WILLIAM H. MEADE, M.D., F.A.C.S.
LANSING, MICHIGAN

THERE has been a great increase in the number of elderly persons in the United States. The degenerative changes associated with old age, particularly in the vascular system, and the increase in the number of serious injuries, many of which involve the vascular tree, has heightened interest in the repair or replacement of diseased or injured segments of blood vessels. Furthermore, with improved anesthetic technic and the radical surgical procedures now employed in the attempt to eradicate cancer, repair or replacement of segments of the vascular tree is more imperative. The problem is far from new. Aneurysms were described in the ancient literature, though little is recorded of their treatment. In more modern times a number of methods of approach have been described and advocated. Among these are ligation, proximal to the aneurysm, distal to the aneurysm and a combination of the two;[1] endoaneurysmorrhaphy;[2] intravascular wiring;[3] external reinforcement of the wall with cellophane[4] and various plastics,[5] with the production of fibrosis; resection of the diseased vessel and replacement with homografts[6] or venous autografts, and resection of the vessel and restoration of continuity by means of various plastic fiber tubes.[7] In the past three years the two methods last mentioned have been used, with a high percentage of successful results. When feasible, these appear to be the methods of choice.

In some cases it may not be feasible to resect the entire diseased portion of the vessel, because of the loss of circulation to some vital part. After resection the condition of the remaining portion of the vessel may warrant reinforcement. Procurement of a satisfactory supply of homografts remains a serious problem. Grafts of fascia lata have been advocated and reported successful.[8] The strength of fascia lata, however, is great in only one direction; transversely this fascia is rather weak.

Dermal grafts for repair of the dura, incisional hernias, fractures, arthroplasties of the knee, hip and elbow joints and dislocation of the shoulder, have been reported as early as 1913. Cannady,[9] in 1942, reported 5 cases in which dermal grafts were used in repair of extensive hernias and of a patellar tendon. Previously, dermal grafts had been used by Straatsma,[10] Smith, Brown and several others in the repair of contour defects around the face and nose. Peer,[11] Harkins[12] and Horton[13] have reported clinical and experimental studies on the fate of buried dermal grafts in subcutaneous tissue, muscle and peritoneum. The presence of epidermal appendages and small inclusion cysts was noted for a relatively short time after implantation, but these later disappeared, except for some small residual inclusion cysts. After a year some of these cysts appeared to be invaded by granulation tissue and it was concluded

---

Read at the Twentieth Annual Congress of the United States and Canadian Sections, International College of Surgeons, Philadelphia, Sept. 12-15, 1955.
Submitted for publication Nov. 26, 1955.

that eventually they would become fibrosed.

Longmire[14] reported the use of a split graft for reinforcement of the suture line in the aorta, after thromboendarterectomy, for localized occlusion in the terminal portion of the aorta. No infection developed and a satisfactory result was obtained. Gray, Mansberger and Yaeger[15] reported studies on the fate of buried full thickness skin in 1951. They reported the occurrence of inclusion cysts and nonunion between the epithelial surface and the underlying fat. For this reason, they advised against the use of buried full thickness skin.

Dermal grafts provide strong elastic sheets, with opportunity for vascularization, both superficial and deep. Reports of their successful use in the treatment of large abdominal hernias have suggested perhaps this tissue would provide adequate reinforcement for damaged or diseased arterial walls and might have value in the reinforcement of suture lines or areas of weakness in the walls.

REPORT OF CASES

C. W., whose exact age was unknown but who appeared about 65 years old, was first seen at St. Lawrence Hospital on Dec. 16, 1950, for treatment of injuries, the result of his being struck by an automobile. The patient was conscious, but confused. Marked periorbital hematoma, and compound fractures of the right tibia and fibula, dislocation of the right shoulder and multiple abrasions were observed. The liver was palpable 2 fingerbreadths below the costal margin, and there was marked tenderness in the lower part of the abdomen. The shoulder dislocation was reduced, and the injured lower extremity was treated in Buck's traction, with a Kirschner wire through the os calcis.

After three days the sensorium cleared and the patient's general condition appeared fairly good. He continued, however, to complain of abdominal pain, and at this time a large mass was palpable below the umbilicus. The patient was seen in consultation by Dr. William Meade, who made a diagnosis of aneurysm of the abdominal portion of the aorta.

The size of the mass increased slowly, and there was continued evidence of peritoneal irritation, which suggested the possibility of a small perforation.

The Kahn test gave negative results, and studies of the blood and urine revealed no essential abnormality.

Because of the increasing size of this mass, it was decided that surgical treatment was indicated. On Jan. 22, 1951, the patient was taken to the operating room for an exploratory laparotomy. The abdomen was opened and the small bowel displaced into the right upper quadrant to expose the abdominal mass. There was pulsation in the iliac arteries, indicating patency of the aneurysm. The mass extended from the renal artery to the bifurcation of the aorta. The peritoneum overlying the mass was incised, and the peritoneum was dissected free from the arterial wall anteriorly. A needle was inserted into the aorta above the mass, and 20 cc. of diodrast was injected, after which a roentgenogram was obtained. This showed that there was considerable clot in the aneurysm, as the radiopaque material "puddled" to the periphery. An attempt to insert a stainless steel wire into the aneurysm to increase the clot was unsuccessful. Two soft spots in the wall of the aneurysm were noted anteriorly, just above the right and left common iliac arteries. Reinforcement of the aneurysmal wall with dermal grafts was decided upon. Full thickness skin grafts were cut from the left thigh with the dermatome. The graft was then split, and the superficial portion was sutured over the donor site. The dermal grafts were placed over the anterior and lateral walls of the aneurysm, where it was sutured above to the wall of the aorta and below to the common iliacs (Fig. 1*A*). The posterior peritoneum was then replaced over the dermal grafts but not closed. The anterior peritoneum was closed with continuous No. 00 chromic catgut. No. 24 through-and-through stainless steel wires were placed through the abdominal wall. The fascia was then closed with interrupted No. 00 silk. The subcutaneous fascia and skin were closed with No. 80 cotton. The wire stay sutures were then tied, and the dressing was applied.

The immediate postoperative course was uneventful. The patient was given penicillin, 100,000 units every three hours, and streptomycin, 0.5 Gm. twice daily. His temperature rose to 103.6 F. on the third postoperative day, and from then until the time of his death

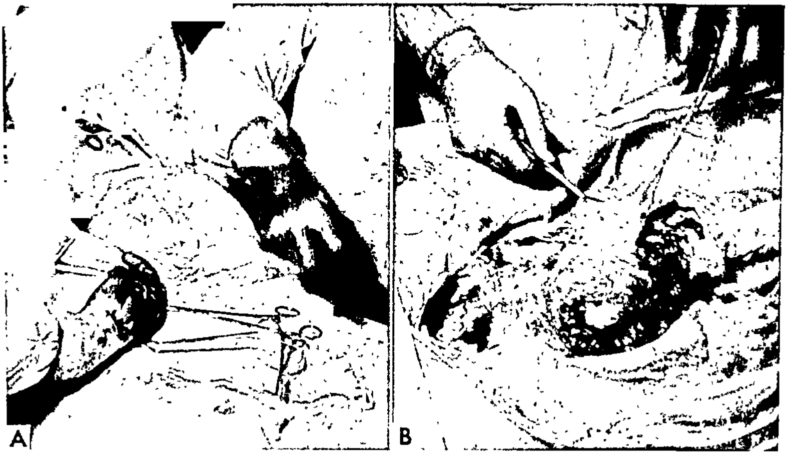


Fig. 1.—*A*, abdominal aortic aneurysm partially covered with dermal grafts. *B*, dermal graft partially removed from abdominal aortic aneurysm at autopsy.

it ranged from 100.0 to 101 F. About 6 p.m. on January 29, while the patient was on the bedpan, he experienced a severe pain in the abdomen and quickly went into shock and died.

At autopsy, rupture of the aneurysm on the right side, just above the iliac artery, was observed. This was just within the lateral margin of the skin graft. The pathologist's report was as follows: "The aneurysm began at the diaphragm and ended at the bifurcation of the aorta at the iliac artery. The aneurysm was carefully exposed. The renal arteries were examined. They were not involved. Three large skin grafts were observed over the anterior surface of the aneurysm. These grafts exhibited evidence of healing. They were adherent to the underlying tissue (Fig. 1*B*). Beneath one graft there was a collection of blood, which was of recent origin. The layer of blood was about 0.5 cm. thick. The area of rupture of the aneurysm was identified on the right posterior side. This was lateral to the skin graft. There was a huge rent, 10 cm. in length. The edges of this rent were irregular and hemorrhagic. Huge clots of blood were extruded through the rent. Large masses of laminated clot were observed immediately beneath the surface of this opening. The wall of the aneurysm, in the region of the rupture, was extremely thin, soft and necrotic. It measured no more than 2 mm. in thickness. The aneurysm was fusiform, measuring up to 15 cm. in diameter. The iliac arteries were traced downward. The openings into the iliacs were diminished in caliber but were patent. There was no evidence of any dissection of the aneurysm into the renal arteries or into the iliac arteries. There was no evidence of dissection of the aneurysm within the aorta itself.

"The aorta exhibited moderate to marked atherosclerosis of the ascending and descending portions respectively, and an extreme degree of atherosclerosis of the abdominal portion. As aforedescribed, almost the entire abdominal portion of the aorta consisted of an aneurysm. The wall of the aneurysm was made up almost entirely of laminated blood clot. The media and adventitia were identified in most areas. The intima was thick and was made up of large atherosclerotic plaques. There was no evidence of syphilis. In the region of the rent there was a disruption of continuity of the wall, with marked recent hemorrhage. Numerous special sections were made of the skin grafts over the anterior surface of the aneurysm. The wall of the aneurysm in some areas was extremely thin and amounted to nothing more than a thickened intima, to which the subcutaneous tissue of the skin graft appeared to be adherent. The skin grafts exhibited excellent healing. There was marked fibroblastic proliferation, and the formation of new blood vessels was noted. There were a few macrophages and numerous multinucleated giant cells of the foreign body type. Proliferation of the capillaries was observed. Under some of the pieces of skin there was evidence of old hemorrhage, which showed organization with beginning fibroblastic proliferation. There was also evidence of recent hemorrhage, which was observed between the wall of the aneurysm and the superimposed skin graft."

CASE 2.—W. M., a white man aged 56, was admitted to the St. Lawrence Hospital on Feb. 24, 1953. His admission complaints were of pulsating masses in both thighs. In the winter of 1951, while shoveling snow, he had a sudden pain in his right thigh. Throbbing pain in the right thigh continued, radiating to the knee; he also had some pain in the medial aspect of the left thigh. About four months prior to his admission he noted the pulsating masses in his thighs.

The significant events in the past history were an attack of inflammatory rheumatism in 1931 and a coronary occlusion in 1944.

The blood pressure in millimeters of mercury was 135 systolic and 80 diastolic. There was no clinical evidence of cardiac abnormality other than an occasional extra systole. There were pulsating masses in both thighs; 3 by 5 cm. on the right and 2 by 2 cm. on the left. The femoral, popliteal, dorsalis pedis and posterior tibial pulses were present bilaterally. Laboratory work revealed no abnormality.

On Feb. 25th, 1953, a bilateral lumbar sympathectomy was done and an arteriogram taken. A fusiform aneurysm in the right femoral artery was noted to extend from the deep femoral to the adductor canal. On the ninth postoperative day there was evidence of infection in the incision on the left side, and this area was drained. The subsequent course was uneventful, and the patient was discharged from the hospital on March 8, with instructions to occlude, intermittently, the femoral arteries below the inguinal ligament.

He was readmitted to the hospital on April 29, and on the following day a dermal graft was applied to the right femoral artery (Fig. 2*A*). The graft was sutured in place with No. 000000 black silk, and the wound was closed with No. 80 cotton. Postoperatively the patient was given penicillin, 400,000 units every three hours, and dicrysticin, 1 ampule every twelve hours. The maximum postoperative temperature was 99.4 F. On May 2 it was noted that the dorsalis pedis and posterior tibial pulses at the ankle were good. The postoperative course was uneventful. On May 14 the donor site was dressed and, except for scattered small hematomas beneath the graft, was healed. The patient was discharged from the hospital on May 14.

He was readmitted May 16 with thrombophlebitis of the right leg. Dicumarol was administered, and he responded well. He was discharged May 30, having been provided with an elastic stocking.

He was readmitted on Aug. 31, for reinforcement of the left femoral artery with a skin graft. On this admission he was somewhat anemic; the value for hemoglobin was 11.6 Gm., or 75 per cent. On the following day he was taken to the operating room and a spinal anesthetic was administered. The femoral artery was dissected from above the origin of the deep femoral to the origin of the popliteal, and the wall was reinforced with a dermal graft (Fig. 2*B*). When the operation was completed it was noted that the foot was cold and dusky. No popliteal, dorsalis pedis or posterior tibial pulses were palpable. It was the impression that thrombosis of the femoral artery had developed and further operative intervention at this time was contraindicated. On return to his room anticoagulant therapy was begun; heparin, 50 mg. every three hours, given intravenously, and dicumarol, 300 mg., given orally.

At 10 p.m. on the night after the operation, examination showed a cold, blue left foot. The patient was returned to the operating room, and spinal anesthesia was induced. The popliteal artery was exposed and thrombosed. The vessel was opened, and a considerable amount of clot was removed by suction, but there was no evidence of bleeding from the proximal end of the artery. The lower end of the femoral artery was exposed and opened. More clot was removed, but the free flow of blood was not reestablished. The artery was closed and ligation carried out above the arteriotomy site. The color of the extremity was not improved, and although it was hoped that collateral circulation might suffice to sustain the extremity, it was considered probable that amputation would be necessary. On the patient's return to his room, antibiotic and anticoagulant therapy were reinstituted. On September 1 bleeding from the donor site was noted and the patient went into shock. He responded well to blood

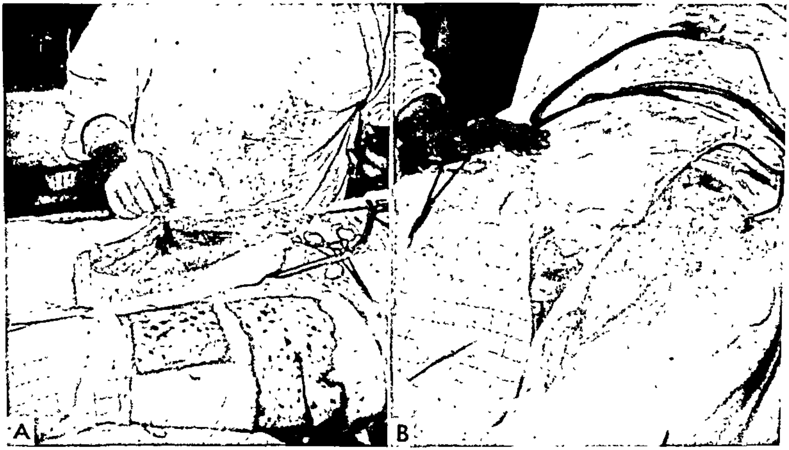


Fig. 2.—*A*, right femoral aneurysm covered with dermal graft. *B*, left femoral aneurysm covered with dermal graft.

therapy. On September 11 a supracondylar amputation of the left lower extremity was done. The lower part of the aneurysm and graft were removed. The subsequent hospital course was uneventful. The maximum postoperative temperature was 100 F.

The patient was eventually fitted with a prosthesis, which he has worn without unusual difficulty. He has since moved to California, and a communication from his physician was received on Aug. 10, 1955, stating that the patient was concerned about the enlargement of a pulsating mass in the right thigh, over the femoral canal. On examination, the right thigh and leg were normal as to warmth. A moderately large pulsating mass, measuring 10 by 4 cm., was palpable along the femoral canal, transmitting pulsation with the cardiac beat. There was no edema of the leg. There were no changes of the nails or nailbeds. The peripheral pulses were palpable. There was some discomfort on walking, although it was not severe.

CASE 3.—H. D., a Negro aged 72, was admitted to the St. Lawrence Hospital on Oct. 31, 1954, complaining of intermittent numbness of the fingers of the left hand for the previous three months. About two weeks prior to admission he had found himself unable to pick up objects with the left hand.

At the age of 8 years the patient had fallen and injured his spine. Muscular atrophy of the lower extremities resulted, and he had used crutches since.

The blood pressure in millimeters of mercury was 160 systolic and 90 diastolic. There was severe scoliosis to the right, as well as lumbar lordosis. The muscles of the lower extremity were contracted, and all joints were in a position of flexion but could be passively fully extended and flexed. The left hand was cold and weak. There was no radial or brachial pulse. There was a pulsatile mass in the lateral axillary wall. Sympathetic blocks caused no improvement in the condition of the hand. On November 3 the aneurysm was opened, and a thrombectomy in the brachial and radial arteries was carried out. Pulsation at the wrist returned but was poor. The color and temperature of the hand showed no change. The impression was that the palmar arches were probably thrombosed, as well as the brachial and radial arteries were thrombosed. Postoperatively, antibiotic and anticoagulant therapy was given. On November 5 the hand was still cold and weak. At about 4:30 p.m. on that day there was some bleeding through the dressing. It was not considered significant.

There was little change in the patient's condition until November 13, at which time he went into profound shock. He was given plasma and blood and taken to the operating room. The brachial wound was opened and the clot evacuated. Bleeding from the aneurysm was noted, and the defect was closed with No. 00000 black silk. A graft was cut from the lateral surface of the arm and the epidermis removed by scraping. This was placed over the suture line. On November 20, gangrene of the tip of the thumb, index and middle fingers was noted. There was also some necrosis of the skin in the interdigital webbing between the thumb and index finger. On December 31 the tips of the thumb and index finger were ampuated and the necrotic skin of the webbing removed. At this point it was obvious that the intrinsic muscles of the lateral half of the hand, as well as the tendon to the index finger were necrotic. On Jan. 31, 1955, the index finger was amputated subcutaneously, and the skin was used to cover the defect in the interdigital webbing. On February 28 the patient was discharged.

At the most recent examination, on September 3, the brachial and radial pulses were absent; the hand was warm, and there was evidence of loss of the intrinsic musculature of the lateral half of the hand and contracture of the intrinsic musculature to the little and ring fingers. Flexion of the remaining fingers and thumb was extremely limited, and the patient had no grasping function whatsover. In spite of this, the extremity is more useful to him than a prosthesis would ever be.

COMMENT

Three cases in which dermal grafts were used to reinforce the walls of aneurysms and 1 in which it was used to reinforce the suture line after aneurysmorrhaphy are reported. The use of this procedure is not advocated as a replacement for arterial homografts, but rather as a supplement in the treatment of injured or diseased vessels. Because of the elasticity and strength of the dermis, and because of its incorporation as living tissue when buried in the tissues of the body, it has excellent properties for the reinforcement of blood vessel walls. With the advent of the antibiotics, infection about these grafts, when they are used intelligently, is uncommon. Foreign body reaction does, of course, occur early, but not intensely enough to cause extrusion or absorption, unless there is associated infection.

From our experience with the skin in its normal relation to the body, one would expect that these grafts would stretch with the repeated increase and decrease of pressure in the artery. Even with this stretch, however, a considerable amount of its strength would be retained, and the likelihood of rupture of a vessel would be considerably diminished, but that the aneurysm would continue to increase in size. This was borne out in the case in which the femoral aneurysms were reinforced. In the case of abdominal aneurysm the vessel was not completely encircled with the graft. It will be noted that the rupture occurred, not in the area which at operation appeared to be the most vulnerable, but farther back, near the margin of the graft. A minimal amount of dissection was done around this aneurysm, as it was feared that it might rupture during the operation. Had the skin grafts completely ensleeved the aneurysm, it is possible that we could have postponed rupture for quite some time. In the third case a relatively small graft was used, primarily to reinforce the suture line and prevent further bleeding in the site of aneurysmorrhaphy.

It is obvious that replacement of the diseased or injured vessel with a graft is a more desirable procedure. The procurement of satisfactory homografts, however, continues to be extremely difficult, and it may be that reinforcement of an aneurysm may help to sustain life until a satisfactory replacement segment can be obtained. Plastic replacement tubes give promise of being a satisfactory substitute for segments of the larger vessels, but thrombosis in these tubes continues to present difficulties, and it would appear that perhaps the use of such tubes, reinforced with dermal grafts, might make anticoagulant therapy in the postoperative period less dangerous, and thereby improve the handling of these difficult vascular problems.

The dermal grafts used were cut by setting the Padgett dermatome at its maximum depth and then resetting the knife and splitting the grafts, so as to leave a relatively thin superficial layer, as has been pointed out by Zintel.[16] This can be replaced on the donor site to insure healing. Maximum setting of the dermatome will not always provide a full thickness of skin, but the remnant of dermis is so thin as to present a problem of healing if not recovered.

SUMMARY

A review of the uses of dermal grafts is presented, with a résumé of the treatment of aneurysms. Three cases are presented in which dermal grafts were used in the reinforcement of aneurysmal walls or reinforcement of an arterial wall following aneurysmorrhaphy. Dermal grafts are satisfactory tissue for reinforcement of vessel walls.

ZUSAMMENFASSUNG

Es wird ein Überblick über die Verwendung von Hauttransplantaten unter Berücksichtigung der Behandlung von Aneurysmen gegeben. Drei Fälle werden dargesetellt, in denen Hauttransplantate zur Verstärkung der Wände des Aneurysma oder zur Verstärkung der Arterienwand nach Aneurysmaoperation angewandt wurden. Hauttransplantate sind ein geeignetes Gewebe zur Verstärkung von Gefässwänden.

RÉSUMÉ

L'auteur fait une revue sur l'utilisation des greffes de peau et il donne un résumé sur le traitement des anévrismes. Il présente aussi trois cas pour le traitement desquels il a utilisé des greffes de peau pour renforcer les parois d'anévrismes ou pour rendre plus forts les parois d'une artère après une anévrismorrhaphie.

D'après l'auteur les greffes de peau sont des tissus très satisfaisants pour renforcer les parois des vaisseaux.

RIASSUNTO

Vengono passati in rassegna i metodi del trapianto dermico nel trattamento degli aneurismi. Vengono presentati tre casi in cui la parete dell'aneurisma fu rinforzata con un trapianto dermico dopo aneurismorrafia. Questo tipo di trapianto si dimostra soddisfacente.

SUMÁRIO

É feita uma revisão do uso dos enxertos de derma, com um resumo do tratamento dos aneurismas. São apresentados três casos em que foram usados enxertos de derma para reforçar as paredes aneurismaticas ou para o reforço de uma parede arterial após a aneurismorrafia. Os enxertos de derma representam tecidos satisfatorios para o reforço das paredes de vasos.

REFERENCES

1. Christopher, F.: Philadelphia: The W. B. Saunders Company, 1950.

2. Matas, R.: [illegible] Surg., Gynec. & Obst. [illegible] 1903.

3. Keen's Sur[illegible] W. B. Saunders Company, 1909. Linton, R. R., and Hardy, I. B.: New England J. Med. 246:847, 1952. Blakemore, A. H.: Progressive Constrictive Occlusion of the Aorta with Wiring and Electrothermic Coagulation for the Treatment of Arteriosclerotic Aneurysms of the Abdominal Aorta, Ann. Surg. 137:760, 1953.

4. DeTakats, G.: [illegible] by Cellophane Fibr[illegible]

5. Grindlay, J. H., [illegible] Sponge Which Acts as a Framework for Living Tissue; Experimental Studies and Preliminary Report of Use to Reinforce Abdominal Aneurysms, Arch. Surg. 63:288-287, 1951.

6. *Dubost, C.; Allary, M.; Mitchel, G., and* Oeconomos, N.: Resection of an Aneurysm of the Abdominal Aorta; Reestablishment of the Continuity by a Preserved Human Arterial Graft with Results After Five Months, Arch. Surg. 64:405-408, 1952.

7. Harris, E. J.; Shumacker, H. B.; Siderys, H.; Moore, T. C., and Grice, P. F.: Pliable Plastic Aortic Grafts, Arch. Surg. 71:449, 1955.

8. Wylie, E. J.; Kerr, E., and Davies, O.: Experimental and Clinical Experience with the Use of Fascia Lata Applied as a Graft About Major Arteries After Thromboendarterectomy and Aneurysmorrhaphy, Surg., Gynec. & Obst. 93:257, 1951. Sabo, Y.: Prevention of Dilatation in Autogenous Venous and Pericardial Grafts in the Thoracic Aorta. Surgery 30:148, 1951.

9. Cannady, J. E.: Repair of Incisional Hernias with Skin, Ann. Surg. 115:775-781, 1942.

10. Straatsma, C. R.: Use of Dermal Graft in the Repair of Small Saddle Defects of the Nose, Arch. Otolaryngol. 16:506, 1932.

11. Peer, L.: Type of Buried Grafts Used to Repair Deep Depressions in the Skull, J.A.M.A. 115:357-360, 1940. Peer, L. H., and Paddock, R.: Histologic Studies on the Fate of Deeply Implanted Dermal Grafts: Observations on Section of Implants Buried One Week to One Year, Arch. Surg. 34:268, 1937.

12. Harkins, H. N.: Cutis Grafts—Clinical Experimental Studies on Their Use as a Reinforcing Patch in the Repair of Large Ventral and Incisional Hernias, Ann. Surg. 122:996, 1945.

13. Horton, C; Georgiade, N.; Campbell, F.; Masters, F., and Pickerell, K.: The Behavior of Split Thickness and Dermal Grafts in the Peritoneal Cavity—An Experimental Study, Plast. & Reconstruct. Surg. 12:269, 1953.

14. Longmire, W. P.: Thromboendarterectomy for Localized Occlusion of the Terminal Aorta, J. Surg. 36:286, 1954; 286-293, 1953.

15. Gray, D. B.; Mansberger, A. R. Jr., and Yeager, G. H.: The Fate of Buried Full Thickness Skin, Ann. Surg. 134:205, 1951.

16. Zintel, H. A.: Resplitting Split-Thickness Grafts with the Dermatome: A Method for Increasing the Yield of Limited Donor Sites, Ann. Surg. 12:1-5, 1945.

Most surgeons, in however general a way they have started and however "general" they may wish to remain, become to some extent specialists as they grow older, because they are attracted more and more to work of a special kind, because chance association or some feature of the district in which they work brings them many cases of a particular nature, or because they are recognized by their fellows as being unusually skilled in some form of treatment, and are asked to undertake it to an extent that practically excludes other work.

Such specialization, which is the natural outcome of a man's inclinations and ability, is inevitable, indeed highly desirable. All specialism, whether medical or surgical, has originated thus in the vision, energy, and enterprise of one man or a group of men, but it tends to be perpetuated by men of a different type. It is against the closed shop, designed to keep the privileges and emoluments of practice to those within the fold, removing its recruits at an early age from the competitive struggle of general medicine and surgery, and tending therefore to attract men in search of safety and an assured income rather than of adventure and discovery, that criticism must be levelled.

—*Ogilvie*

Genitourinary Surgery

Present Conceptions of Varicocele and its Treatment

EURICO BRANCO RIBEIRO, M.D., F.A.C.S., F.I.C.S.*
SAO PAULO, BRAZIL

IDEAS about varicocele are so many and at the same time so contradictory that it would be boring to review and analyze each of them carefully. Different opinions are still expressed; old arguments already perishing are remembered, and unreasonable ideas are still often spread, owing to a lack of wise criticism. Space does not permit me to discuss those different ideas, to exterminate old arguments and to reveal the unreasonableness of some of the opinions.

I shall, therefore, mention only the points I consider essential to a good idea of varicocele, exactly as it should be understood in accordance with current knowledge.

We call varicocele a tumor of varying volume and consistency that results from the expansion, extension and torsion of the veins of the spermatic cord and the corresponding scrotum. What is really observed, however, is the expansion, extension and torsion of the scrotal veins, as in the cord, only on a level with the pampiniform plexus, i.e., only off the fibrous tunic that enfolds this plexus can the unusual increase of the veins' caliber be observed.

From these facts one may draw a first conclusion: The veins become varicose where there are no rigid tissues to restrain them, but they permit easy expansion of the force coming from inside the circulatory current in the areas of soft cellular tissue, adjacent to the skin and highly elastic.

The varicocele does not occur in many men, but it does occur in some, even with the same anatomic conditions of the region affected. One easily arrives at the conclusion that the patient with varicocele is under influences capable of increasing the tension of the blood in the scrotum veins.

"That means the inversion of the spermatic venous current," quickly explain the most outstanding authors of our day. If the current is inverted, it is a proof that an endovasal force exists, which, besides being capable of exceeding and stopping the physiologic influx, can also compel it to return to the antiphysiologic current, looking for new anastomotic channels that will finally allow it to drain in the great venous central canal, the lower vena cava.

But now we ask: "What is the reason for the venous reflux through the spermatic vein?" In reply to this question we would probably get the most absurd answers, anatomically speaking. As the varicocele is often located in the left side and only unusually in the right, among other reasons, the following were presented: the compressive consequence of the

---

Submitted for publication Aug. 26, 1955.
*Director of the Sanatorio Sao Lucas, Sao Paulo, Brazil.

descending colon, a greater extension of the spermatic vein at the left, and its disembouchement at a right angle in the left renal vein, while at right it disembouches at an acute angle in the lower vena cava. It is easy to see that such arguments are nonsense. Intraperitoneal compression by the normal organs is practically the same for all patients; the greater extension of the left spermatic vein would be considered only if varicocele occurred in very tall men and never in short ones, thus indicating some influence of the greater or less length of the vein; the disembouchement at a right angle of the left spermatic vein, in the left renal vein, would better justify the more rapid deflux of the normal circulation of the spermatic vein, as the left renal vein gives away a great quantity of blood and then requires greater speed flow. This would establish a kind of siphon movement which would facilitate the draining of the spermatic vein instead of producing the reflux there; and at right, disembouching at right angle in the lower vena cava. The spermatic vein would have to support a voluminous column of liquid that theoretically would facilitate its reflux. In practice that does not occur.

Referring to the nonexistence of valves —which is another resort to explain the inversion of the current—if we find anatomists who mark it out, we also find writers, e.g., Winsbury White, who maintains that the pampiniform plexus enfolds many valves. Some writers, like Revington, have said that there are valves on a level with the orifice of both the spermatic veins. Opposing statements obviate any conclusions about the role of valves in the development of varicocele.

It has been clearly proved that there is a venous reflux. Through many works of Eduardo Cotrim and Jarbas Barbosa de Barros of Brazil, as well as from works by Ivanissevich, Bernardi and others, of Argentina and, even more recently, from researches of Abdel Rahman and Edward Mina[*] in Egypt, it has been proved that the circulatory current of the spermatic vein in the patient with varicocele, when he stands up, appears inverted and the venous drainage takes place through the vas deferens and the funicular vessels, then reaches the hypogastric, the epigastric and even the saphenous and pudendal veins on the opposite side, forming a large network of venous origin.

It has also been proved that the reflux is not permanent but intermittent. It occurs when the patient is standing up and increases when he makes a certain kind of physical effort, disappearing when he is in the decubital position. Roentgen tests of this are conclusive.

But what causes the "deflux"?

There is no doubt that it is caused by a total or partial intermittent interruption of the venous current, on a level beyond the spermatic vein, so as to derive from it, totally or partially, the great mass of blood which flows out from the kidney. What kinds of interruption of the current can account for this? They can be classified into three types: (1) pathologic formations; (2) anatomic elements, and (3) anatomic anomalies.

1. The venous compression produced by pathologic adhesions due to tumors of renal origin and to swollen glands, has been pointed out as the essential cause of the varicocele called "symptomatic," because the varicocele, in the symptomatic picture of the morbid process, appears as one of the elements of diagnosis. All authors agree on this point.

2. Among the anatomic elements capable of producing compression of the left renal vein, the first pointed out is the one called aorta-superior mesenteric compass, i.e., the acute angle formed in the place of origin of the superior mesenteric artery

---

[*] Rahman, A., and Mina, E.: Anatomical and Surgical Aspects in the Operative Management of Varicocele, Urol. & Cutan. Rev. 44:257 (May) 1950.

of the abdominal portion of the aorta. Exactly at that point, and taking a transverse direction, is regularly situated the left renal vein. Now in a tall and visceroptotic patient in certain postures—marching or making physical effort—the superior mesenteric artery may temporarily remain stretched, compressing the left renal vein, which has soft walls, against the rigid walls of the abdominal portion of the aorta. This probably causes a total or partial stop of the venous circulation.

I am not presenting mere theoretical possibilities. Several arguments convince me that the compression of the left renal vein by the aorta-superior mesenteric compass may occur. First, varicocele occurs by far the most frequently in tall, thin men, in whom this compass is more nearly closed, and seldom in short, fat men, in whom it is more open and invested of subperitoneal adipose tissue. Second, it can be assumed that compression by the compass is considered by classic authors to be the pathogenic agent. This is well known in the case of the compression of the terminal part of the duodenum by the superior mesenteric artery toward the aorta, producing expansion, upper stasis and digestive troubles, sometimes of great intensity, in such a way as to force deviation of the trajectory of the food bola by means of gastrojejunostomy, after the always advisable adequate gastric resection. If the aorta-mesenteric compression may be prejudicial to the duodenum, which has large and elastic walls, I am convinced that it influences even more intensely, and with greater prejudice, the soft and flexible walls of the left renal vein. This is undoubtedly the reason one encounters more cases of varicocele than of duodenal disturbances due to this cause. I have already published a roentgenogram of a patient with varicocele, which shows the duodenum compressed by the aorta-superior mesenteric compass and the concomitance of the etiologic agents.

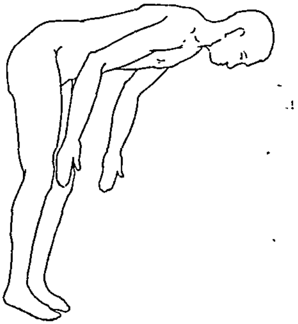


Fig. 1.—The "bow signal" (see text).

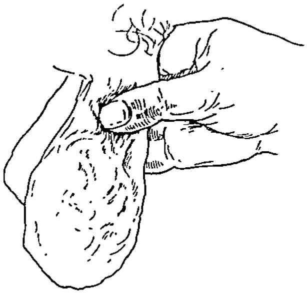


Fig. 2.—Note remarkable decrease of tension in ectatic veins.

Another anatomic structure that can be presented as a probable cause of compression of the left renal vein is the Treitz ligament; as it stretches through the intestine in the visceroptotic patient, it is also capable of provoking interruption of the venous circulation, which runs behind it.

Authors still point out t istence of a small lympha *under the place of origin of* mesenteric artery. T cause, at least a cause, in certain circumstances, of the painful passage of venous blood through the aorta-superior mesenteric compass.

Another argument, and a highly convincing one, is the fact varicocele never occurs in the quadruped. This has been pointed out by several authors, but they did not take advantage of it to present conclusive statements.

I have established *a priori,* and put into practice in a completely satisfactory way, a clinical sign of the so-called essential varicocele. This consists of examination of the decrease of venous tension in the veins of the hemiscrotum affected when the patient changes from an erect position to flexion of the trunk, bowing downward. I call this signal the "bow signal" (Fig. 1). It is easily tested as follows: With the patient standing up, the physician holds the affected hemiscrotum within the four fingers and the thumb, and he can then observe the remarkable decrease of tension in the varicose veins when the patient bows. The bow signal, therefore, shows that when the aortic-superior mesenteric artery compass opens, the blood starts to circulate again through the left renal vein, the reflux through the spermatic vein stops, and the tension on the ectatic hemiscrotal veins decreases (Fig. 2).

3. There is still something to consider: the occurrence of anatomic anomalies capable of producing interruption of the normal drainage of the left renal vein. Among the anomalies pointed out, it is convenient to state the outstanding anomalies marked by the retroversion of the left renal vein in relation with the abdominal portion of the aorta. It is easy to understand that, when such anomalies occur, the venous blood of the left renal vein will have to drain through a narrow passage between the tight walls of the abdominal portion of the aorta and the tough surface of a vertebral body. In such cases one should not even attempt to secure an intermission of the compression, but only a partial permanent compression, or even a total definitive interruption obtained with the growing of the organism to maturity.

The question of anomalous trajectories of the left renal vein and their relation to varicocele are being carefully studied at the Faculdade de Medicina de São Paulo (Medicine University of São Paulo, Brazil), by Dr. Liberato João Affonso Di Dio, of the Department of Anatomy of that distinguished center of education and research. They have there a collection of almost 200 cadavers, of different ages and races. I hope that Dr. Di Dio's researches will confirm the ideas here presented as to interruption of the left renal venous flow on a level with the aorta.

If this really takes place, it could seem strange that all the intense flux of the blood that flows out from the left renal vein is accomplished through the reflux noted in the spermatic vein, since the velocity of the circulating mass would be such that it would hardly occur to anyone to mention venous stasis in connection with varicocele. The fact is that, in addition to the deviation of the spermatic system, the venous circulation also starts running, for the most part, by means of a powerful net of anastomoses that grows around the left kidney and has been particularly studied by Fagarassanu. It is a collateral system of opposite appearance, with the venous system at the right, and it allows the left renal venous blood to get to the heart without using either the truncal way or the longer and more complex trajectory through the spermatic vein. These vessels originate in the left renal vein before its crossing with the aorta and anastomoses with the azygos vein and with the vena cava, passing in front of the aorta or behind it, establishing what Fagarassanu so aptly called reno-azygos, preaortic renocaval and retroaortic reno-caval "safety conduits." This system specially guarantees the efficiency of the return circulation of the left kidney.

It is easy to understand, therefore, why the kidney does not suffer when one tries to cure varicocele by tying the veins of the pampiniform plexus of the veins of the spermatic trunk.

If Fagarassanu's "safety conduits" are still not sufficiently developed to fulfill the abrupt deficiency associated with interruption of the spermatic vein, what will occur is expansion of the remaining part of the spermatic vein from the ligature to its disembouchement in the left renal vein, despite the pressure exerted by the abdominal wall and the abdominal contents upon the segment. This fact is well documented by a phlebogram on page 77 of the book *Varicocele*, by Ricardo Barnardi, in which are shown, in addition to the enlarged spermatic vein, the trajectories of two "safety conduits," one directed upward and inward and the other downward and inward.

In such an emergency the return circulation of the testicle is accomplished through the many anastomoses that help carry the blood to the iliac veins, as I have already explained.

Once the problem of varicocele is understood, a clear conclusion appears. There is no need—and it may be even inconvenient—to interrupt definitively the circulation through the spermatic vein. The venous reflux is intermittent, and it would be difficult to remove its cause on a level with the aorta-superior mesenteric artery compass, it is only necessary to obtain also an intermittent and synchronic interruption of the spermatic vein to obtain the disappearance of the reflux. This is confirmed if one establishes a pulley on a level with the external orifice of the inguinal canal, by means of enbowing the tributary vessels of the spermatic vein, which are enclosed in a tunnel made by a fold of the great oblique muscle aponeurosis. Every time the patient makes a physical effort or remains in a position that causes interruption of the current through the left renal vein, this same effort or posture produces compression on a level with the pulley established near the external *orifice of the inguinal canal*, preventing the reflux of the venous blood through the spermatic vein.

In addition to guaranteeing the persistence of the pulley, fixation of the veins by means of a tunnel made of the great oblique muscle aponeurosis has the final *result of making varicocele disappear* and of correcting one of its most obvious symp-

Data on 272 Patients Surgically Treated Between 1936 and 1950

Race	*Number*	*Per Cent*
Negro	5	1.8
White	255	93.7
Halfbreed	12	4.4

Nationality	*Number*	*Per Cent*
Brazilian	233	85.6
Portuguese	19	6.9
Italian	7	2.5
Spanish	5	1.8
Argentine	1	0.3
Polish	1	0.3
Hungarian	1	0.3
Lithuanian	1	0.3
English	1	0.3

Age, Years	*Number*	*Per Cent*
10 to 15	8	2.9
16 to 20	78	28.6
21 to 25	66	24.2
26 to 30	39	14.3
31 to 35	28	10.2
36 to 40	19	6.9
41 to 45	13	4.7
46 to 50	9	3.3
51 to 55	10	3.6
56 to 60	1	0.3
61 to 65	1	0.3

Marital State	*Number*	*Per Cent*
Single	162	59.5
Married	108	39.7
Widowed	2	.7

toms, namely, testicular ptosis. In fact, by suspending the varicocele veins and enclosing them in a tunnel of aponeurosis, one will obtain (1) correction of ptosis of the testicle; (2) repression of the veins affected among fibrous tissues, combating their expansion, and (3) distention of the veins affected, preventing blood stasis.

After reaching these results by tunnelization, I proceed to cure varicocele by an operative process, essentially conservative, which is easily performed in any surgical environment.

Surgical Technic.—The technic of the tunneling procedure is as follows:

1. The classic incision for repair of inguinal hernia is made (oblique, starting in the spine of the pubis and finishing about 2 fingerbreadths from the anterior and superior iliac spine).

2. The surface of the great oblique muscle aponeurosis is widely exposed, leaving the external ring of the inguinal canal visible.

3. The spermatic cord is grasped and widely exposed, from the external ring of the inguinal canal to the neighborhood of the testicle, which, for this reason, is pressed from the outside by soft traction exerted by the surgeon through the very same cord, helped by pressure made by the assistant through the scrotum and the clothes that cover the patient.

4. The fibrous tunic that enfolds the cord is opened, after which the veins are isolated by round dissection of the varicose veins, the vas deferens being separated from them, with its artery (*top*, Fig. 3). (One should bear in mind that this artery is not always visible.)

5. The vas deferens and its artery are left aside at the bottom of the operative site, between the pillars of the external orifice of the inguinal canal.

6. The ectatic veins are set over the great oblique muscle aponeurosis (*center*, Fig. 3), disposed in "straps" forming a horseshoe shape with the concavity turned downward, and inward, at such a height as to permit the superior pole of the testicle to remain a little lower than the spine of the pubis.

7. The veins so placed are fixed by means of a fold of the great oblique muscle aponeurosis, supported by separated points, so as to create a tunnel in which the veins are protected. The tunnelization starts in the higher part of the strap, perforating the aponeurosis from outside the strap foundation, and then from the inside, with the same thread, at such a distance that, when the knot is tied, the fold of the aponeurosis covers the venous trunk completely (*bottom*, Fig. 3), without interrupting its circulation. The same process is repeated at other points along the strap until the tunnel is completed. Care should always be taken not to strangle the venous current, which will then circulate through the free tunnel of aponeurosis. In certain cases when the patient is fat or the operative site becomes small the external branch of the tunnel may be constructed by fixing the aponeurosis to the subcutaneous cellular tissue in the vicinity of the crural arcade, this always being done by means of separated points.

8. The skin is sutured with agraphes, if necessary preceded by the subcutaneous cellular tissue approach.

The tunnelization may be performed with simple catgut No. 0 or 1, with Brady catgut No. 0 or with cotton thread. I have been using simple catgut or Brady catgut.

Spinal anesthesia allows easier handling of the great oblique muscle aponeurosis, but narcosis in a closed circuit, or any other well-carried anesthesia, provides a looseness of the fibers which tends to make the tunneling easier to perform.

The results of this procedure were remarkable in nearly 300 patients, 272 of

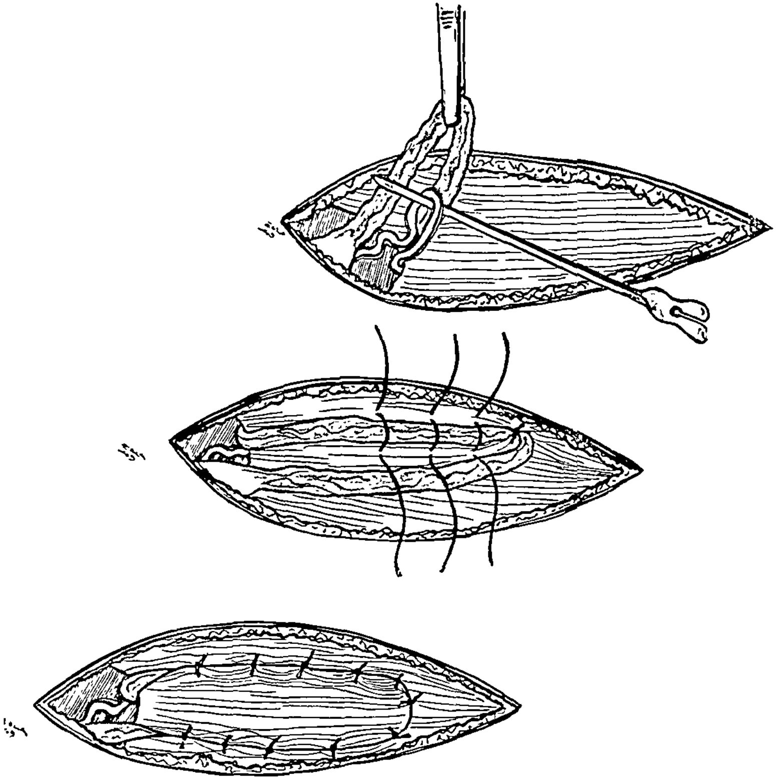


Fig. 3.—*Top,* vas deferens isolated from the cord. *Center,* venous loop applied to aponeurosis of external oblique muscle. *Bottom,* tunnel formed to enclose the veins.

whom (those operated on between 1936 and 1950) are classified as to race, nationality, age and marital status in the accompanying table.

The excellent results of the tunneling procedure have also been observed by many surgeons who perform it inside and outside Brazil, and the many appreciations written by outstanding foreign authors about it are really worthy of registration.

After a comparative study of the results obtained with several processes, Dr. Carlos A. Formenti and Dr. Horácio José Dorado, of Buenos Aires, in a very incisive manner, finish with these remarks: "Si a ello agregamos que la técnica de Branco Ribeiro es sencilla, facil, no traumatica, conservadora y se ajusta a los postulados anteriores, podemos dicir que por el momento es el procedimiento del elección en el tratamiento del varicocele" (La Prensa Méd. Argentina 38:922, 1951).

Some time ago, in a personal communication, another surgeon of Buenos Aires, Dr. José Joel, said: "Efetivamente, hasta ahora ha sid el procedimiento suyo el que mas satisfaciones nos ha dado en el tratamiento del varicocele: los resultados son excelentes y immediatos." He confirmed these opinions in a published article (Dia Méd. 21:156, 1949).

In Argentina the tunneling procedure was recommended by Dr. Juan Carlos Guzzetti, who declared: "Soy un convencido de la efectividad de su método, que seguiré aplicando hasta que alguien me demuestre que existe algo más innocuo y mejor"—and by Ricardo Finochietto, whose judicious opinion was as follows: "La operación para el varicocele es la ñina mimada de nuestra escuela." His opinion has been echoed by the many surgeons who come to hear him and learn from him.

Recently Dr. Alex Higginson, Professor of Urology at the Medical Faculty of Lima, Perú, after performing the tunneling operation in 50 cases, wrote me: "Considero el procedimiento de Ud. el más de acuerdo com el cuerpo de doctrina actual del varicocele."

Protected by so many distinguished opinions, the tunneling procedure, now being adopted in many countries, in the near future will surely gain a more outstanding place in the treatment of varicocele.

SUMMARY

The author describes and recommends the tunneling procedure in the treatment of varicocele, which is now being tried and adopted in many countries and has been highly recommended by distinguished surgeons. The technic is outlined, and data on 272 patients are presented in tabular form.

SUMARIO

O Autor descreve e recomenda o processo do tunel para o tratamento da varicocele, método êste que tem sido experimentado e adotado em muitos paises e tem sido recomendado por muitos cirurgiões de nomeada. A técnica de tal método é apresentada, sendo dados os resultados em quadros.

ZUSAMMENFASSUNG

Der Verfasser beschreibt und empfiehlt das Tunnelungsverfahren in der Behandlung von Krampfaderbrüchen. Die Methode wird zurzeit in vielen Ländern ausprobiert und akzeptiert und erfreut sich der Empfehlung erstrangiger Chirurgen. Die Technik wird beschrieben, und die Ergebnisse werden in tabellarischer Form dargestellt.

RIASSUNTO

L'autore descrive e raccomanda la tecnica della tunnellizzazione nella cura operatoria del varicocele che ora sta entrando nella pratica generale. Ne descrive la tecnica ed espone i suoi risultati.

RÉSUMÉ

L'auter présente et recommande la méthode chirurgicale du "tunnelisation" pour le traitement de la varico cèle telle qu'elle est essayée et acceptée dans plusieurs pays par des chirurgiens distingués. L'auteur décrit la technique et il présente ses résultats au moyen de tableaux.

* * *

Classification of Tumors of Testis

M. M. MELICOW, M.D.*

NEW YORK CITY, NEW YORK

THE unique clinical course and remarkable pathologic picture presented by testicular tumors are of interest to clinicians, urologists and pathologists. The medical literature on the subject is voluminous, the terminology is extensive and the classifications are numerous, varied and at times confusing. Before presenting what I consider a logical "working" classification of tumors of the testis, a review of progress in the understanding of this disease is in order.

Historical Review (Table 1).—The first to record a tumor of the testis is said to have been St. Donat, who in 1696 identified a "rudimentary skull and pigmented optic cups in a scrotal mass." He must indeed have been amazed at such a finding! Prochaska in 1809, André del Perrone in 1838 and Johnson in 1856 recognized teratomatous testicular tumors. In 1854 Curling classified neoplasms of the testis into two groups: (1) benign cysts, and (2) malignant solid tumors. He believed that the latter developed in the region of the rete testis. In 1855 Verneuil described dermoids of the testis. In 1877 Langhans and Kocher reported on the microscopic picture of testicular tumors. Wilms, in 1898, noted the tridermal character of some of the growths and proposed the following classification: (1) embryomats ("cystic fetuses"), and (2) embryoid or teratomatous tumors ("solid non-fetal"). He subscribed to Marchand-Bonnet's theory that neoplasms of the testis arose from isolated blastomeres. Wilms further recognized the fact that in some cases one type of tissue tended to outgrow the rest and to dominate the picture. The Cohnheim theory of embryonic cell rest as the mechanism of tumor development was accepted by most pathologists, and in the case of neoplasms of the testis the growth was ascribed to inclusion of elements of the wolffian body in the developing gonad. All tumors of the testis were looked upon as teratomas. Many pathologists, however, continued to label the growths on the basis of component cells; and, since the latter varied considerably in different specimens, an extensive and unwieldy nomenclature was accumulated.

A change in point of view with regard to testicular growths occurred in 1906, when Chevassu observed that a large number of patients with neoplasms of the testis presented somewhat similar clinical pictures, as well as gross and microscopic features that were uniform. It was his impression that the component cells resembled those lining the seminiferous tubules. He concluded that they were not teratomas but rather growths composed of seminal cells or "seminomas." Other names that have been applied to this tumor are round cell sarcoma, embryonal sarcoma, large cell sarcoma, unicellular carcinoma, monocellular carcinoma, embryonal carcinoma with lymphoid stroma, spheroidal cell carcinoma, germinoma and dysgerminoma.

A controversy then arose among pathologists, and two schools of thought emerged. One held that *all* testicular neoplasms were *teratomas* and attributed the variations to the overgrowth of one or

---

*Assistant Clinical Professor in Urology, College of Physicians and Surgeons, Columbia University, and Uropathologist, Squier Urological Clinic, New York, N. Y.

Read at the Twentieth Annual Congress of the United States and Canadian Sections, International College of Surgeons, Philadelphia, Sept. 12-15, 1955.

Submitted for publication Sept. 28, 1955.

more cell elements, with partial or complete suppression of the remainder. Various names were used: teratomas, teratoid tumors, embryonal teratomas, embryonal carcinomas or embryonal sarcomas, teratocarcinomas, embryoid tumors, embryomas, etc. The other school divided tumors of the testis into 2 groups: (a) teratomas and (b) seminomas. The differences in the points of view continued until 1929, when Zondek reported the presence of prolan A in the urine of a patient with a tumor of the testis. Other investigators repeated the test in similar cases and confirmed the observation. Here was the first biologic test for one type of cancer! Enthusiasm ran high. Unfortunately the impression gained ground that *all* tumors of the testis induced a positive reaction, and that a negative one ruled out tumor. Some workers suggested that the amount of gonadotropic hormones excreted in the urine varied directly with the embryonal character of the tumor. The more embryonal it was, the higher the titer. It was even recommended that classifications, operative procedures and prognoses be based on the gonadotropin assay of urine. Then contradictions were discovered. There were many patients with proved neoplasms whose reactions had been negative. "False positives," on the other hand, were obtained from patients without testicular tumor, in cases of hydrocele and in patients orchiectomized for reasons other than neoplasm. Material for tests performed with concentrated urine specimens contained sufficient anterior pituitary-like hormone to give a pseudopositive reaction. Subsequently it was determined that only tumors that contained *trophoblasts* were associated with a positive reaction and that gynecomastia was the result of *hyperestrinism* from any source.

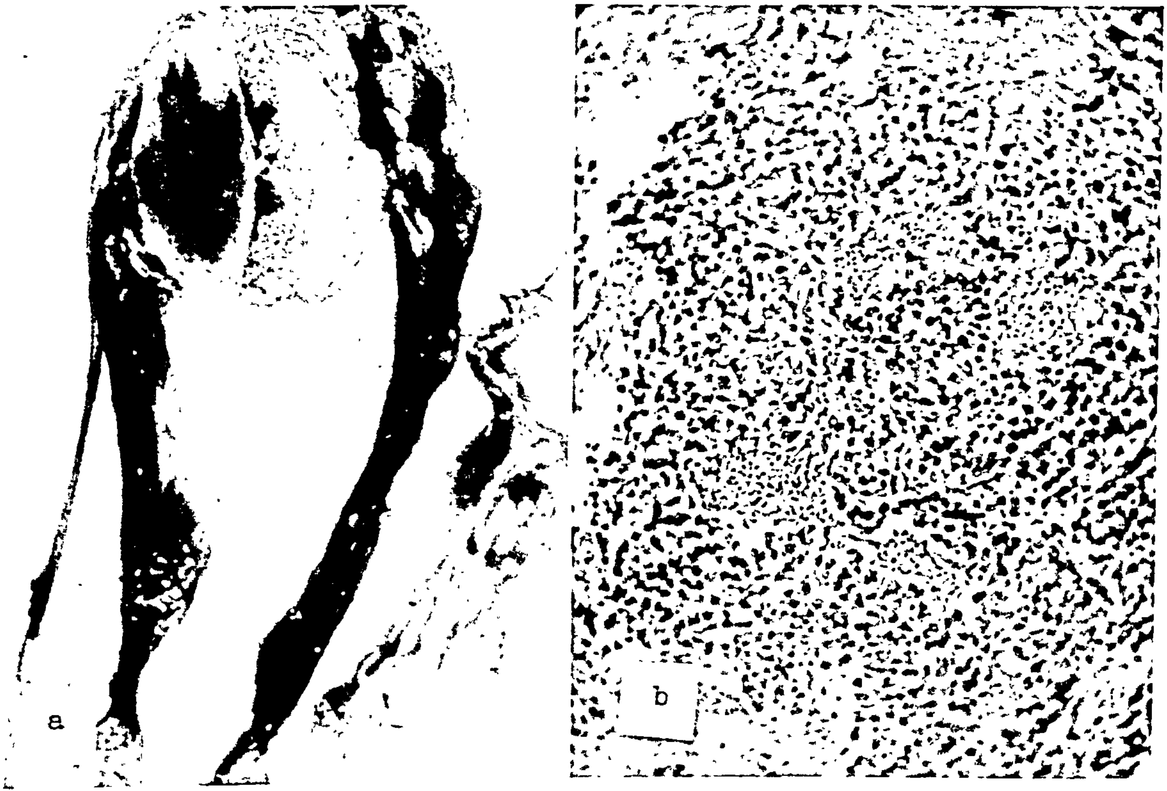


Fig. 1.—Radical orchiectomy for seminoma (*a*). Seminoma (*b*). Note unicellular character.

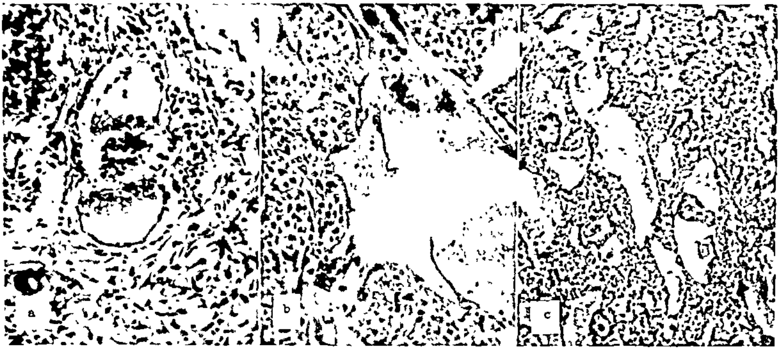


Fig. 2.—Embryonal carcinoma. Embryoid bodies or blastulas (embryoma), *a*; choriocarcinoma (note syncytiotrophoblasts invading blood vessel), *b*; embryonal carcinoma, *c*.

In the meantime it became apparent that the urine of patients with pure seminoma gave a negative reaction for gonadotropins. Thus the seminomas were established as an entity separate from the "teratomas." At present this division of the family of testicular neoplasms into two branches is accepted by most pathologists. The pathologic picture and clinical course of seminomas was fairly uniform, while the pathologic picture of the embryonal tumors was varied and the clinical course less predictable.

The terms used to designate the embryonal group of tumors, usually based on the histologic picture, continued to be extensive and confusing. Peyron and Limousin in 1936 and Melicow in 1940 observed embryoid bodies in a tumor of the testis. Similar observations were later (1946) recorded also by Friedman and Moore. The latter authors presented the following classifications:

1. Seminoma
2. Embryonal carcinoma
   Chorioepithelioma
3. Teratoma
4. Teratocarcinoma

Teilum compared tumors of the testis with those of the ovary (1944, 1950) and called attention to the homologous relation between neoplasms of these organs. His classification was as follows:

Type of Cell	*In Testis*	*In Ovary*
Tumors of gonocytes	Seminoma	Dysgerminoma
Tumors of Sertoli cells	Androblastoma	Androblastoma
Tumors of Leydig cells	Interstitial cell tumor	Arrhenoblastoma
Tumors of embryonal cells	Embryonal carcinoma	Embryonal carcinoma
Tumors of extracoelomic cells	Mesoblastoma	Mesoblastoma
Tumors of trophoblasts	*Choriocarcinoma*	*Choriocarcinoma*

I should like to present a classification of tumors of the testis which I consider logical and relatively easy to remember. It is based on 2 postulates:

1. That the majority of tumors of the testis arise from its component elements. The significant cells that comprise the latter are: (a) spermat

TABLE 1.—*Contributions to the Study of Tumors of the Testis**

In 1696	St. Donat identified a rudimentary skull and pigmented opic cups in a testicular tumor.
In 1809	Prochaska, and in 1838 André de Perrone recognized teratomas.
In 1850	Leydig discovered interstitial cells.
In 1856	Johnson suggested tridermal composition of testicular neoplasms.
In 1865	Sertoli described the cells now bearing his name.
In 1872	Waldeyer reported an interstitial cell tumor.
In 1895	Sacchi reported pedomacrosomia in a boy with an interstitial cell tumor.
In 1896	Wilms stressed the tridermal origin.
In 1906	Chevassu ascribed unicellular tumors to adult seminal cells and proposed the term 'seminoma'.
In 1922	Ball reported interstitial cell tumors in dogs.
In 1926	Michalowsky produced teratomas in fowl by the injection of 5% zinc chloride solution.
In 1929	Zondek found Prolan A in the urine of a patient with teratoma testis.
In 1936	Limousin and Peyron, and in 1940 Melicow described embryoid bodies in a tumor of the testis.
In 1940	Hooker and Gardner found interstitial cell tumors in immature male mice receiving estrogen.
In 1945	Teilum reported a feminizing testicular tumor of Sertoli cells which he named androblastoma.
In 1946	Friedman and Moore reviewed and classified 922 cases of tumor of the testis from the army.

*See alphabetized bibliography at end of article.

TABLE 2.—*Classification of Tumors of the Testis*

Primary
I. Germinal
  1. Pure seminoma
  2. Embryonal tumors
    (a) Embryoma
    (b) Choriocarcinoma
    (c) Embryonal carcinoma
    (d) Teratocarcinoma
    (e) Adult teratoma
  3. Combinations of 1 and 2, and of the subgroups of 2.
II. Nongerminal
  1. Interstitial cell tumors
  2. Sertoli cell tumors (androblastoma)
  3. Tumors of testicular stroma: fibroma, lipoma, hemangioma, etc.

Secondary
I. Lymphomas, plasmacytomas, leukemic and lymphocytic infiltrations, etc.
II. Carcinomatosis with involvement of testis.

TABLE 3.—*Data on 128 Cases of Tumor of the Testis*

	Cases
I. Adult patients, 121 cases	
A. Primary, 107 cases	
1. Germinal, 102 cases	
Seminoma	56
Embryomatous tumors	23
Teratocarcinoma	18
Adult teratoma	5
2. Nongerminal, 5 cases	
Interstitial cell tumors	4
Granulosa cell tumors	1
B. Secondary, 14 cases	
To carcinoma of bile ducts	1
To reticulum cell sarcoma	4
To lymphosarcoma	4
To plasmacytoma	4
To carcinoma of prostate	1
II. Children, 7 cases	
A. Primary, 3 cases	
1. Germinal 1 case	
Embryonal carcinoma	1
2. Nongerminal 2 cases	
Interstitial cell carcinoma	1
Lymphosarcoma	1
B. Secondary, 4 cases	
To the lymphomas	2
To sympathicoblastoma	1
To retinoblastoma	1

cells); tumors that arise from them are "germinal tumors," and (b) interstitial cells, Sertoli cells and cells that line the rete testis; tumors that develop from these cells and from the testicular stroma are the "nongerminal tumors."

2. That the family of "germinal" tumors is composed of two subgroups because of difference in response of the original germ cells to some unknown carcinogenic agent(s). The response varies as follows:

a. When the germ cells are stimulated to divide and multiply *without disturbing*

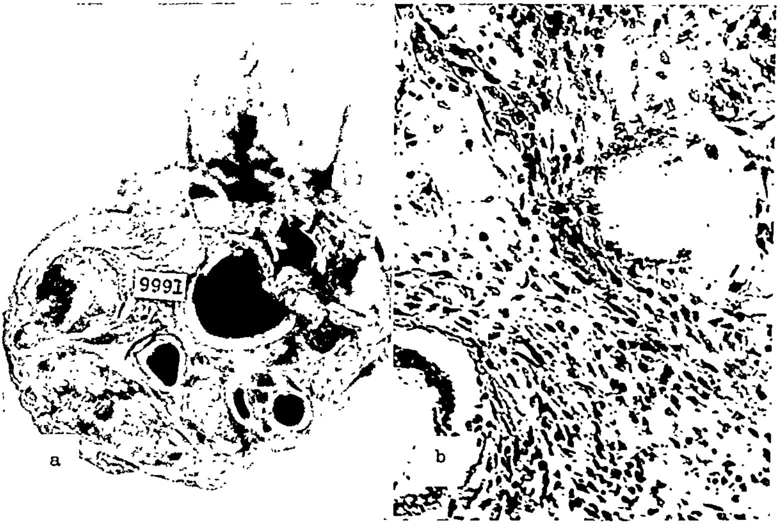


Fig. 3.—Teratocarcinoma (*a*). Note cystic areas. Microscopic sections (*b*), showing partial differentiation.

the trigerminal potential that is locked within their nuclei, the resultant tumor is a uniform mass of cells known as *seminoma* (Fig. 1).

b. When the carcinogenic agent(s) or factor(s) not only stimulates the cells to divide but at the same time forces them to *release* the trigerminal potential inherent in their nuclei—this without benefit of union with an oöcyte—a chain of events is set in motion that simulates the development of an embryo. The resultant masses comprise the *embryonal tumors*. In normal pregnancy the fertilized ovum rapidly divides to form a blastula with an inner cell mass and an outer ring from which chorionic cells differentiate. The counterpart for this stage is seen in the embryonal tumors. On rare occasions one encounters a growth that contains blastulas (*embryoma,* Fig. 2). This is usually accompanied by chorionic tissue (choriocarcinoma). In normal pregnancy the blastula quickly breaks into three germ layers: ectoderm, mesoderm and endoderm. The blastulas in the testis, too, are split into such layers but compression by surrounding tissue and the "unnatural" environment produce a hodgepodge distortion of the primary layers, with one layer, usually endoderm, outgrowing the rest (*embryonal carcinoma* or adenocarcinoma). In normal pregnancy the three germ layers now tend to differentiate into tissues, organs and systems. Should an aberration occur at this stage, a teratoid monster may form. One may surmise, on the basis of the postulate, that similar attempts at differentiation into tissue elements within the distorted primitive layers of a germinal tumor result in the formation of a teratocarcinoma (Fig. 3).

TABLE 4.—*Differentiation*

1. Somatic tumors and seminoma	start as differentiated tumors and tend to become undifferentiated.
2. Embryonal tissue and embryonal carcinoma of testis	start as undifferentiated cells and tend to become differentiated.

Complete differentiation into organs and systems characterizes the normal fetus at term. In an *adult teratoma* of the testis there is likewise differentiation of the distorted mass into adult tissue and organoid elements (Fig. 4). Growth of a testicular tumor, viewed in the light of the postulate, may be looked upon as a moving picture process, which, however, may be "frozen" at any stage. Metastasis can occur at any level and the process continued in the metastasis, so that the histologic picture may differ from that of the primary focus. Extremes in the groups of germinal tumors are rare: embryomas, because they are unstable and quickly form embryonal carcinomas; and adult teratomas, because in most cases metastases, either in the embryonal carcinoma or the teratocarcinoma stage, destroy the patient before local differentiation has occurred. Choriocarcinomas, too, are infrequent. They tend to invade blood vessels and on occasion, by producing a local infarct and scar, may leave no local trace in the testis. Yet their metastases can grow luxuriantly and destroy the host. Embryonal carcinomas and teratocarcinomas constitute the major portion of the second group of germinal testicular tumors.

TABLE 5.—*Metastases from Germinal Tumors of Testis*

Tumor	*Metastasis*
Pure seminoma	Usually as seminoma*
Embryoma	Usually as embryonal carcinoma; embryoid bodies; chorionic elements
Choriocarcinoma**	Usually choriocarcinoma: embryoid bodies; embryonal carcinoma
Embryonal carcinoma	Usually as embryonal carcinoma, teratoid elements
Teratocarcinoma	Usually as embryonal carcinoma teratoid elements
Adult teratoma	Benign, does not metastasize†

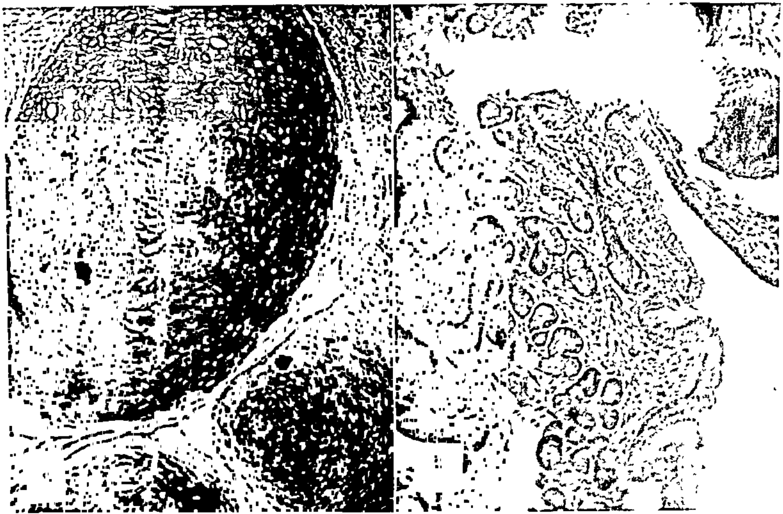
*Rarely, a component of embryonal carcinoma may be present in the original tumor. It may be missed and may appear in the metastasis as an embryonal carcinoma or teratocarcinoma or even as an area of differentiated tissue.

**Rarely, a choriocarcinoma may invade a blood vessel, cause an infarct and end up locally as a scar. Distantly, in the metastasis, it may continue to grow luxuriantly.

†If a metastasis is present then the primary tumor probably contained an area of malignancy which was probably missed.

The line of cleavage between subgroups of germinal tumors is not sharp; one may observe chorionic cells in embryonal carcinomas and in teratocarcinomas, and at times the embryonal carcinoma elements in a teratocarcinoma are so numerous that, unless block sections are made, the partly differentiated teratoid portion may be missed. It is to be expected that embryonal carcinomas will show a marked variation in their histologic pattern. One germinal layer may predominate in a particular case and another layer in a succeeding case. Local factors may oppose or stimulate differentiation and may account for the formation of a nodule of embryonal carcinoma in one area of a tumor of the testis, with a nodule of more differentiated tissue, namely, teratocarcinoma or adult teratoma, in another area.

Seminoma. — In this series seminoma was usually painless, hard, smooth, heavy, homogeneous in consistency and pinkish on section. Greyish areas of necrosis, sometimes resembling caseation, were present, as were occasionally small foci of hemorrhage. The microscopic sections revealed masses of large, usually oval cells with prominent nuclei. Branching connective tissue trabeculae divided the masses of cells into compartments. A



[illegible] : (*b*) adult mucosa.

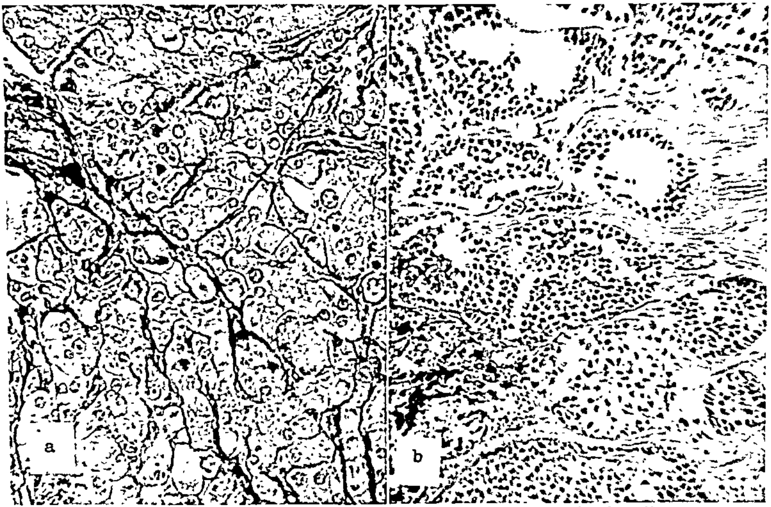


Fig. 5.—Interstitial cell tumor (*a*) in 5-year old boy with macrogenitosomia. Sertoli cell tumor (*b*) in a 52-year-old man; the androblastoma of Telium.

lymphoid stroma of variable intensity was often present. The neighboring testicular tissue was compressed, and the tubules were usually atrophic. Anaplasia was accompanied by variation in cellular and nuclear size and shape, an increase in mitoses and a decrease in stromal elements and lymphocytes (Fig. 1).

Seminomas behaved in a manner similar to cancer of other organs of the body (somatic tumors). Both seminomas and somatic tumors began as well-differentiated neoplasms and in their life cycle tended to become undifferentiated or anaplastic (Table 4). Seminomas tended to metastasize via the lymphatics, usually to the retroperitoneal lymph glands and the lungs. They were *highly radiosensitive tumors* and responded well to operation nd/or radiotherapy. The improvement n results is noteworthy. The salvage rate in this disease has risen considerably (80 to 90 per cent), mainly because of early diagnosis and prompt and adequate treatment.

Embryonal Tumors. — Embryonal carcinomas included the rare embryoma, choriocarcinoma and a large group of tumors of varied microscopic pattern. All these neoplasms were uniformly aggressive, almost all displayed a predilection for vascular invasion and resistance to radiotherapy. Some of the patients complained of a painful scrotal swelling which was irregularly hard and at times tender. On section the tumors appeared as pinkish masses lined with jagged, greyish, motheaten borders. They frequently contained scattered crimson pools of fresh hemorrhage. Unlike seminomas which behaved like somatic growths, the component cells of embryonal tumors behaved like the early blastomers of an embryo. The cells started out as anaplastic primitive embryonal cells, and tended toward differentiation; i.e., embryonal carcinoma — teratocarcinoma — adult teratoma (Table 4).

The type of embryonal tissue that developed after release of the trigerminal potential was probably governed by general and local, biologic, chemical (endocrine?), physical and other unknown factors. The latter probably varied in every case. It was not surprising, therefore, to

TABLE 6.—*Survival Rate Among Patients With Germinal Tumors*

Tumor	*Type of Operation*	*No. Cases Followed*	*Survival 2 Yr.*	*Survival 5 Yr.*
Seminoma	Simple orchiectomy	33	20/27	18/29
	Radical orchiectomy	14	11/11	7/8
	Abdominal orchiectomy	2	2/2	2/2
Embryoma	Simple orchiectomy	1	0	0
Choriocarcinoma	Simple orchiectomy	2	0	0
Embryonal carcinoma	Simple orchiectomy	11	6/10	5/10
	Radical orchiectomy	7	3/6	2/5
Teratocarcinoma	Simple orchiectomy	14	3/7	3/7
	Radical orchiectomy	2*	......*	......
Adult teratoma	Simple orchiectomy	3	3/3	3/3
	Radical orchiectomy	2	2/2	......

*Less than 2 years.

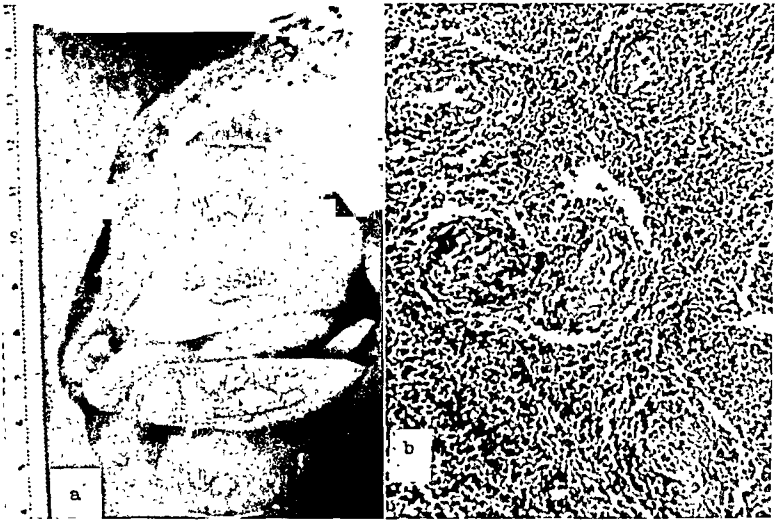


Fig. 6.—Plasmacytoma (*a*) invading testis; gross specimen. Lymphosarcoma (*b*) invading testis; microscopic section. Note infiltration of neoplastic cells between tubules.

have encountered few embryonal carcinomas that presented identical microscopic patterns. *Variation* was the essential characteristic of this tumor. On rare occasions the sections showed blastula-like structures (embryoma) lying in a wild stroma containing foci of chorionic tissue and hemorrhage (Fig. 2). Usually the hodgepodge of embryonal tissue showed a preponderance of tissue elements that were interpreted as endodermal in origin. Papillary formations and pseudoglandular structures were present (embryonal adenocarcinoma). Intertwining infolded layers of fairly large cells, supported by a vague mesenchymal stroma, were frequently seen. At times the tumors were made up of small cells in clusters surrounding small spaces. This pattern has been labeled mesodermal carcinoma. Tumors with myxomatous components also occurred. There were 3 embryonal tumors associated with masses of large cells that closely resembled seminoma. Finding foci of seminoma cells in an embryomatous tumor was not surprising, since not all germ cells need necessarily release their trigerminal potential in response to the carcinogenic agent(s) or factor(s). There were several embryonal carcinomas with cell patterns superficially resembling seminoma, but close examination revealed a solid array of large cells almost devoid of connective tissue trabeculae and lymphocytes. Block sections eventually exposed foci of papillary and pseudoglandule formation. A few of the tumors showed a sprinkling of tissue that had undergone slight differentiation along the lines of a teratocarcinoma. The merging of embryonal carcinoma with teratocarcinoma can be explained on the basis of the moving picture process as expressed in the postulate. The line of demarcation between embryonal carcinoma and neighboring testicular tissue was not a sharp one. Infiltration between tubules and into the lumen of tubules was often seen. Masses of large, elongated, deep staining cells in the syncytium were characteristic of chorionic tissue, but occasional solitary hyperchromatic giant cells were also present. Smudgy, curvaceous signet ring cells lying in close proximity to paler cells, which have been called appliqué cells, were also encountered. These are looked upon by many as a form of chorionic cell.

Mortality rates were highest for embryoma and choriocarcinoma (100 per cent) and relatively high for embryonal carcinomas (50 to 60 per cent). The end results of teratocarcinoma were no better. This was not surprising, since "no cancer is better than its worst part" and in teratocarcinoma I was dealing with a tumor that was partly differentiated and partly undifferentiated. These tumors were often honeycombed with cysts and interpolated with greyish glistening areas of cartilage. Lying in a field of wildly growing tissue were foci of immature cartilage and glands. There were no deaths in the five-year follow-up of 3 cases of adult teratoma. The adult teratomas contained bone, cartilage, sebaceous glands, cystic structures, old blood, etc. (Table 6).

The age incidence for seminoma showed a peak in the group from 30 to 40, more than half of the tumors having occurred during that decade. The youngest patient was 21 years old; the oldest, 74. The age incidence for embryonal carcinoma was greatest between the ages of 20 and 35, and there were 3 patients under 20.

In the series of 100 cases of primary testicular tumors there were 2 (seminomas) that developed in abdominal testes (L. S. and P. C., aged 47 and 40 respectively; 1 in an ectopic testis (retrovesical), and 2 seminomas that developed in undescended testes on which orchiopexy had previously been performed. These occurred in patients N. S. and C. Q., aged 36 and 37 years respectively, on whom orchiopexy had been performed at the respective ages of 14 and 15 years, and each returned twenty-two years later with a tumor on the operatively treated side. Considerable evidence has been accumulated which suggests that seminoma tends to develop in atrophic testes. *Biopsy* of the gonad should *precede* orchiopexy. If atrophy or germinal aplasia is present, orchiectomy should be performed. The optimum age for orchiopexy is between 5 and 7 years (Robinson and Engle).

Seminoma vs. Lymphosarcoma: There were 4 patients, all over 50, in whom an erroneous diagnosis of seminoma was made either on biopsy, on the basis of the operative specimen, or at autopsy. All had lymphomatous tumors. An anaplastic seminoma and a bizarre lymphoma may be confused for one another, particularly when the *presenting* symptom is a scrotal mass. It is important to call attention to this possible error, since the prognosis of the two diseases is different, being fairly good for seminoma and ultimately hopeless for lymphosarcoma.

Seminoma and other primary tumors of the testis usually expanded and compressed neighboring testicular tissue, and thus a line of demarcation tended to form. In secondary tumors, particularly the lymphomas, the neoplastic cells flowed like lava between tubules isolating them as islands in a sea of neoplastic cells (Fig. 6).

Nongerminal and Secondary Tumors: Nongerminal tumors were rare. A benign interstitial cell tumor of the right testis was removed from a 5-year-old boy with macrogenitosomia. The component cells were typical of the Leydig cell variety but contained no Reinke crystals (Fig. 5). Only slight recession in the precocious sex development was noted in the two-year follow-up. The interstitial cell tumors in adults (4 cases) were observed incidentally. Gynecomastia was not present in this series.

Sertoli cell tumors are rare, and only 1 case, reviewed and accepted by Teilum, was included in my series (Fig. 5). The tumor, a very large one, was removed from a 53-year-old man. The cells resembled the granulosa cells of the homologous tumor of the ovary. Call-Exner bodies were seen. A review of the patient's chart revealed no recorded evidence of feminization.

Secondary tumors of the testis were rare and were part of a general malignant disease, such as lymphosarcoma, plasmacytoma, leukemia, and the end stages of generalized carcinomatosis. The important aspect was recognition of the fact that the testis was involved secondarily and was not the seat of a primary growth.

SUMMARY

1. A classification of tumors of the testis based on two postulates has been presented:

Postulate 1. That all primary tumors of the testis originated from testicular components. Those that arose from spermatogones (germ cells) were designated as *germinal* tumors (95 per cent), and those that developed from Sertoli cells, Leydig cells, stroma, etc., as nongerminal tumors (5 per cent).

Postulate 2. That the family of germinal tumors was divided into two branches, depending on the type of response of the spermatogone nucleus to the carcinogenic agent(s) or factor(s):

a. If the agent(s) or factor(s) merely caused the nucleus to divide without releasing its intranuclear potential, a tumor composed of a uniform array of cells formed. This was the seminoma or dysgerminoma.

b. If the agent(s) or factor(s) caused release of the intranuclear trigerminal potential, a series of events was set in motion simulating those in pregnancy. Thus embryoid bodies or blastulas were formed (embryomas), with or without chorionic tissue (choriocarcinoma), followed by a cleavage into three distorted germ layers (embryonal carcinoma), followed by partial differentiation (teratocarcinoma), and ending as a well differentiated mass (teratoma). The process was thought to be a "moving picture" one and could be "frozen" at any stage. Embryoma and choriocarcinoma were rare and unstable; embryonal carcinoma and teratocarcinoma were more common, and adult teratoma was also rare: embryonal carcinoma and teratocarcinoma tended to metastasize before there was opportunity for further differentiation.

2. Seminoma tended to metastasize via lymphatics and was radiosensitive. A five-year cure was obtained in over 80 per cent of cases. The great improvement in results has been due to early diagnoses, prompt and adequate surgical measures and radiotherapy.

3. Embryoma and choriocarcinoma were highly malignant, and no cures of these tumors were obtained in this series.

4. Embryonal carcinoma and teratocarcinoma tended to be radioresistant. An improvement in the cure rate was noted but the five-year cure rate ranged between 40 and 60 per cent.

5. Seminoma tended to occur in atrophic testes. Two patients on whom orchipexy was performed at the ages of 14 and 15 returned twenty-two years later with seminoma. Orchiopexy should be performed early, at the age of 4 to 5.

SUMARIO

1. É apresentada uma classificação dos tumores do testiculo, baseada em dois postulados:

Postulado I: Todos os tumores primarios do testiculo se originam dos compo-

sentes testiculares. Os que provieram dos espermatogonios (celulas germinativas) foram designados por *tumores germinais* (95 por cento), ao passo que aqueles que provieram das celulas de Sertoli, celulas de Leydig, estroma, etc., por *tumores não germinais* (5 per cento).

Postulado II: A familia dos tumores germinais foi dividida em dois ramos, conforme o tipo de resposta do nucleo espermatogonio ao agente(s) ou fator(es) carcinogenico:

a.) Se o agente(s) ou faotr(es) carcinogenico apenas faz com que o nucleo se divida, sem libertar seu potencial intranuclear, resulta um tumor composto de celulas uniformes. Trata-se do seminoma ou disgerminoma.

b.) Se o agente(s) ou fator(es) fax com que haja libertação do potencial trigerminal intranuclear, desencadeia-se uma serie de fatos que simulam os da gravidez. Formam-se assim corpos embriodes ou blastulas (embriomas), com ou sem tecido corionico (coriocarcinoma), seguindo-se uma clivagem em três camadas germinativas disformes (carcinoma embrionario), seguindo-se uma diferenciação parcial (teratocarcinoma), terminando como uma massa bem diferenciada (teratoma). Teve-se a impressção de que tal processo seja movel e que pode ser surpreendido em qualquer fase. Os embriomas e coriocarcinoma são raros e instaveis; os carcinomas embrionarios e os teratocarcinoma são mais comuns e os teratomas adultos são tambem raros: os carcinomas embrionarios e os teratocarcinomas tendem a dar metastases antes que haja oportunidade para posterior diferenciação.

2. Os seminomas tendem a dar metastases por via linfatica e são radio-sensiveis. Em mais de 80 por cento dos casos foi obtida cura de cinco anos. Melhores resultados têmsido devidos ao diagnostico precoce, medidas cirurgicas prontas e adequadas e radioterapia.

3. Os embriomas e coriocarcinomas são altamente malignos e nesta serie não houve cura destes tumores.

4. Os carcinomas embrionarios e os teratocarcinomas tendem a ser radio-resistentes. Foi notada uma melhoria na taxa de cura, mas a taxa de cura de cinco anos variou entre 40 e 60 por cento.

5. Os seminomas tendem a ocorrer em testiculos atrofiados.

ZUSAMMENFASSUNG

1. Es wird eine auf zwei Grundvoraussetzungen basierte Einteilung der Hodengeschwültse vorgelegt:

Erste Grundvoraussetzung ist, dass alle vom Hodengewebe abstammenden Primärgeschwülste des Hodens, die ihren Ursprung in den Spermatogenen (Keimzellen) haben, als *Keimgeschwülste* (95 Prozent) bezeichnet wurden, und dass die von den Sertolischen Zellen, den Leydigschen Zellen, vom Stroma usw. ausgehenden Geschwülste die Benennung *Nichtgerminale Tumoren* erhielten (5 Prozent).

Zweite Grundvoraussetzung ist, dass die Familie der Keimgeschwülste entsprechend der Reaktion des Keimzellkernes auf das karzinogene Agens (s) oder auf den karzinogenen Faktor (s) in zwei Klassen eingeteilt wurde:

a. Wenn das Agens (s) oder der Faktor (s) nur eine Teilung des Kernes, ohne sein intranukleäres Potential auszulösen, hervorrief, entstand eine aus gleichmässiger Zellanordnung zusammengesetzte Geschwulst. Diese war das Seminom oder Dysgerminom.

b. Wenn das Agens (s) oder der Fak-

tor (s) zu einer Auslösung des intranukleären Keimpotentials führte, kam es zum Ablauf von Vorgängen, die den während der Schwangerschaft beobachteten Prozessen ähnelten. So entstanden embryoide Gebilde oder Keimbläschen (Embryome) mit oder ohne Choriongewebe (Choriokarzinome) gefolgt von einer Spaltung in drei verzerrte Keimschichten (embryonale Karzinome), gefolgt von partieller Differenzierung (Teratokarzinome) und schliesslich gut ausgebildete Massen (Teratome). Der Vorgang wurde mit einem kinematographischen Film, der in jedem beliebigen Augenblick zum Stillstand kommen konnte, verglichen. Embryome und Choriokarzinome waren selten und unbeständig, embryonale Karzinome und Teratokarzinome kamen häufiger vor, und ausgewachsene Teratome waren ebenfalls selten. Die embryonalen Karzinome und die Teratokarzinome neigten zur Metastasierung, bevor eine weitere Differenzierung möglich war.

2. Das Seminom neigte zur Metastasierung auf dem Lymphwege und war strahlenempfindlich. In mehr als 80 Prozent der Fälle wurde eine fünfjährige Heilung erzielt. Die bedeutende Verbesserung der Behandlungsergebnisse ist einer frühzeitigen Erkennung der Krankheit und der unverzüglichen Anwendung ausreichender chirurgischer Massnahmen und der Strahlentherapie zuzuschreiben.

3. Das Embryom und das Choriokarzinom erwiesen sich als äusserst bösartig, und in der vorliegenden Krankenserie wurden keine Heilungen dieser Geschwülste erzielt.

4. Das embryonale Karzinom und das Teratokarzinom zeigten eine Neigung zur Strahlenresistenz. Es liess sich eine Verbesserung der Heilungsquote beobachten, die fünfjährigen Heilungen wurden aber nur in 40 bis 60 Prozent der Fälle erzielt.

5. Das Seminom trat mit Vorliebe in atrophischen Hoden auf.

RÉSUMÉ

1. On a presenté une classification des tumeurs du testicule qui est basée sur deux conclusions.

Demande 1: Que touts les tumeurs primaires du testicule, qui ont leur origine dans les éléments testiculaires, développés de spermatogènes (cellules germinales) soient classifiés comme *tumeurs germinaux* (95%) et ceux qui se développent des cellules de Sertoli et Leydig, du stroma etc. soient nommés *non germinaux* (5%).

Demande 2: Que la famille des tumeurs germinaux soit dividée en 2 branches, dépendant du type de réponse du nucleus spermatogonus a l'agent ou facteur carcinogénique.

a. Si l'agent ou facteur cause seulement la division du nucleus, sans mettre en action son potentiel intranucléaire, un tumeur d'arrangement uniforme des cellules est formé. C'est ce qu'on apelle séminome ou dysgerminome.

b. Si l'agent ou facteur cause la mise en action du potentiel intranuclaire, trigerminal, une série d'évènements se produit, qui ressemble a ceux pendant la gravidité. Ainsi des corps embryoides ou blastulae sont formés (embrryomes) avec ou sans tissu chorionique (choriocarcinome), suivi par une séparation en 3 couches germinales desordonnées (carcinome embryonale) suivi d'une Distinction partiale (teratocarcinoma) et terminant en un tumeur bien différencié (teratoma).

La procédure a l'air d'un film cinématographique qui peut être arreté a toute epoche. Embryoma et choriocarcinoma étaient rares et pas stabiles. Carcinoma embryonale et teratocarcinoma furent observés plus souvent et teratoma adulte fur aussi observé rarément; carcinoma embryonale et teratocarcinoma formaient

souvent des metastases, avant qu'il eut l'occasion d'une différentiation plus exacte.

2. La séminoma avait la tendance de former des metastases via les lymphatiques et était radiosensitive. Une cure de 5 ans fut obtenue a plus que 80% des malades. Des résultats beaucoup meilleurs furent obtenus par une diagnose precoce, des mesures chirurgicales promptes et suffisantes et radiothérapeutique.

3. Embryoma et choriocarcinoma étaient fort malignes et pas une cure de ces tumeurs fut obtenue.

4. Carcinoma embryonale et teratocarcinoma paraissaient radiorésistants. Une plus grande proportion de guérisons fur observée, mais seulement 40 a 60% de ces cas étaient guéris après 5 ans.

5. Séminoma avait la tendance de se développer dans des testicules atrophiques.

RIASSUNTO

1. Viene formulata una classificazione dei tumori del testicolo basata su due conclusioni:

—Che tutti i tumori primitivi del testicolo originati da strutture testicolari di origine spermatica (cellule germinali) vengono indicati come tumori "germinali" (95%), mentre quelli originati da altri elementi come le cellule di Leydig, le cellule di Sertoli, lo stroma etc., vengono indicati come tumori "non germinali."

—Che il gruppo dei tumori "germinali" comprende due sottogruppi a seconda del tipo di risposta del nucleo dello spermatogonio agli agenti o ai fattori carcinogenetici:

a) Se questi determinano sopratutto una divisione nucleare senza liberazione del potenziale intranucleare, allora si forma un tumore composto da un tipo uniforme di cellule, come nel caso del seminoma o disgerminoma;

b) Se invece provocano la liberazione del potenziale trigerminale intranucleare, allora si determina una serie di fenomeni che somigliano a quelli della gravidanza. Si formano, così, dei corpi embrioidi o delle blastule (embriomi), con o senza tessuto corionico (coriocarcinomi) seguiti dalla divisione in tre strati irregolari (carcinoma embrionario) e quindi da una parziale differenziazione (teratocarcinoma) e infine in un tumore ben differenziato (teratoma). Questo processo può arrestarsi a qualunque stadio. Gli embriomi e i coriocarcinomi sono rari e instabili; il carcinoma embrionario e il teratocarcinoma sono più frequenti; il teratoma dell'adulto è raro; il teratocarcinoma e il carcinoma embrionario tendono a dare metastasi precocemente.

2. Il seminoma metastatizza per via l'infatica ed è radiosensibile. Nell'80% dei casi si è ottenuta una guarigione di 5 anni. Questo successo terapeutico è dovuto alla diagnosi precoce, alla tempestività della cura chirurgica e alla radioterapia.

3. L'embrioma e il coriocarcinoma sono molto maligni e non si è mai potuta ottenere una guarigione.

4. Il carcinoma embrionario e il teratocarcinoma sono piuttosto radioresistenti. Si è ottenuto un miglioramento nella prognosi ma la percentuale di successi dopo 5 anni varia fra il 40 e il 60%.

5. Il seminoma compare di preferenza nei testicoli atrifici.

BIBLIOGRAPHY

Annisimova, V.: Am. J. Cancer 36:229, 1939.

Ball: Bull. de l'Assoc. franç. p. l'étude du cancer 11:5, 1922.

Bonser, P. M.: J. Path. & Bact. 54:149, 1942.

Butenandt, and Hanisch, G.: Chemistry 237:89, 1935.

Chevassu: Tumeurs du testicule, Paris 1906, 239.

Curling: Med. Chir. Trans. 36:449, 1854.

Dean, A. L.: N. Y. State J. Med. 51:485, 1951.

Friedman, N. B., and Moore, R. A.: Mil. Surgeon 99:573, 1946.

Hooker, C. W.; Gardner, W. V., and Pfeiffer, C. A.: J.A.M.A. 115:443, 1940.

Johnson: Trans. London Path. Soc. 7:241, 1856

Kocher: ibid Langhans Deutsche chir. 506:949, 1887.

Langhans: Deutsche chir. 506:949, 1887.

Leydig, F.: Ztschr. f. wiss. Zool. 2:1, 1850.

Melicow, M. M.: J. Urol. 44:333, 1940.

Melicow, M. M.; Robinson, J. N.; Ivers, W., and Rainsford, L. K.: J. Urol. 62:672, 1949; Melicow, M. M., ibid. 73:547, 1955.

Michalowsky, I.: Centralbl. f. allg. Path. & Path. Anat. 38:585, 1926; Virchows Arch. f. Path. Anat. 267:27, 1928, 319, 1929.

Perrone, A.: Bull. soc. chir. Paris, 1867.

Peyron, and Limousin: Cited by Weil, A.: Les Tumeurs du Testicule chez l'Homme. Monograph XXII. Paris: Libraire E. Le Français, 1936, p. 79.

Peyron, A; Blanchard, and Salomon, L.: Bull. Assoc. franç. p. l'étude du cancer 25:427, 1936.

Prochaska: Cited by Verneuil, Bull. soc. chir. Paris, 1867.

Robinson, J. N., and Engle, E. T.: J. Urol. 7: 726, 1954.

Schlotthauer, C. F.; McDonald, J. R., and Ballmann, J. L.: J. Urol. 40:539, 1938.

Sacchi, E.: Riv. Sper. d. freniat. a di Medicia Legale 21:149, 1895.

Saint-Donat: Cited by Verneuil: Bull. soc. chir. Paris, 1867.

Sertoli, E., and Morgagni: Naples 7:31, 1865.

Teilum, G.: Nord. med. 27:1905-1908, 1945; Acta Path. et Microbiol. Scand. 23:252, 1946.

Verneuil: Bull. soc. chir. Paris, 1867.

Waldeyer, V. A.: Virchow's Arch. f. Path. Anat. u. Physiol. 55:67, 1872.

Wilms, Z. C.: Z. B. 19:233, 1896.

Zondek, B.: Am. J. Cancer 15:133, 193 (abstract).

Our teachers allow students to choose their own studies, not in order to appeal to intellectual or to professional interest, but because they themselves have no choice of their own in which they believe with sufficient intensity to impose it upon their pupils.

The old classical curriculum was founded by men who had a theory of the world and of human life. They had taken all the available content of human knowledge and had wrought it together into a coherent whole. What they knew was, as judged by our standards, very little in amount. But upon that little content they had expended all the infinite pains of understanding and interpretation. They had taken the separate judgments of science, philosophy, history, and the arts, and had so welded them together, so established their relationships with one another, so freed them from contradictions and ambiguities that, so far as might be in their day and generation, human life as a whole and the world about us were known, were understood, were rationalized. They had a knowledge of human experience by which they could live and which they could teach to others engaged in the activities of living.

—*Meiklejohn*

Neurologic Surgery

Treatment of Certain Types of Chorea, Athetosis and Tremor by Stereoencephalotomy

H. T. WYCIS, M.D., F.A.C.S., D.A.B. AND E. A. SPIEGEL, M.D., D.A.B.

PHILADELPHIA, PENNSYLVANIA

SOME years ago we had an opportunity to review in this *Journal*,[1] some applications of stereoencephalotomy. This method permits one to produce small circumscribed lesions in subcortical areas by electrolysis or electrocoagulation, with minimal injury to overlying cerebral structures. The lesions are made by inserting thin electrodes in the exact direction desired and to the predetermined depth by means of a guiding apparatus called the stereoencephalotome.[2] The previous applications (thalamotomy for emotional disorders and mesencephalotomy for various types of "intractable" pain) have been extended to the diseases of the so-called extrapyramidal system, particularly the involuntary movements associated with chorea and athetosis and the resting tremor characteristic of paralysis agitans and Parkinsonism. Data collected from experiences with these conditions are here briefly summarized.

Before producing lesions in these cases, it seemed desirable to ascertain the functional state of the basal ganglia, chiefly the globus pallidus and the caudate nucleus, by depth electrographic study, and also to evaluate the effect of temporary paralysis, e.g., of the globus pallidus, especially in the presence of involuntary movements, by injection of local anesthetics.

For this purpose a new type of stereoencephalotome was constructed (Fig. 1). It permits one to apply the apparatus repeatedly in exactly the same position. The apparatus is fixed to the skull by means of four hollow screws, into which are threaded four small steel balls on which the feet of the stereoencephalotome may be fixed in any position. The length of these feet can be varied; at their upper ends they are connected to the basal ring by universal joints, so that the base can be easily placed in a position parallel to the plane determined by the Frankfurt horizontal lines. Within the basal ring a horizontal rectangular frame can be rotated and moved forward or backward. The electrode holder can be moved on the frame to left or right and can be rotated in the frontal or the sagittal direction.

In some types, at least, of *chorea* and *athetosis* one deals with an abnormally increased activity of the pallidum. This view can be corroborated from a study of cases of Huntington's chorea, as has been reported.[3] Suffice it to mention that pallid-

---

From the Departments of Experimental Neurology and Neurosurgery, Temple University School of Medicine and Hospital, Philadelphia.

Aided by Grant No. B-470 of the National Institute of Neurological Diseases and Blindness of the National Institutes of Health, United States Public Health Service.

Submitted for publication Sept. 21, 1955.

otomy was performed in 4 cases of Huntington's chorea and in 1 case of chorea electrica. It was ineffective in the last-mentioned case in which there were attacks of violent jumping movements of the whole body, complicated by epileptiform seizures and cerebral dysrhythmia noticeable in the electroencephalogram. In 1 of the 4 cases of Huntington's chorea, hemiplegia developed contralateral to the pallidotomy, caused either by encroachment of the lesion upon the internal capsule or by interference with its blood supply. In a second case a decrease of the involuntary movements was obtained on one side only, despite the bilateral but punctuate pallidal lesions. In the 2 other cases the pallidal lesions resulted in definite diminution or nearly complete elimination of involuntary movements of the extremities after the first operation (right pallidotomy) on the left side and a second-stage operation (left pallidotomy) on the right side. Although a certain degree of recurrence of the involuntary movements in cases of a progressive disease like Huntington's chorea was to be expected, motion pictures taken of the patient observed over the longest period (more than four years) still showed a marked reduction of involuntary movements as compared to the preoperative status. This case is also important with regard to the question whether cessation of the involuntary movements is due to the pallidal lesions or to unintended by-effects upon corticofugal fibers of the internal capsule injured directly by the electrolysis or indirectly by thrombosis of vessels passing through the pallidum. Four years after the operation this patient was able to perform skilled movements with both hands, so that his pyramidal tracts can be regarded as practically unimpaired. It is therefore justifiable to relate the marked reduction of his involuntary movements, still noticeable at the end of this period, to the pallidal lesion.

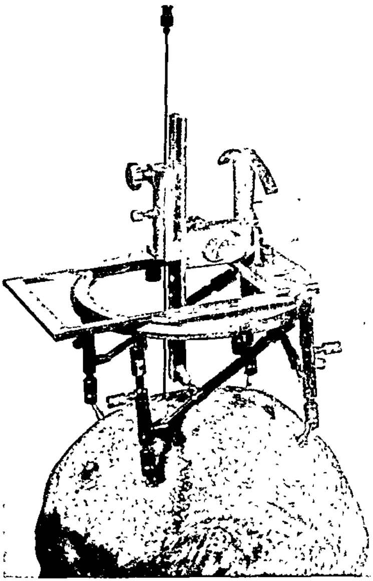


Fig. 1.—Stereoencephalotome, Model V.

Like chorea, the term *athetosis* includes involuntary movements caused by various pathogenetic mechanisms. In order to select the proper patients for treatment by lesions of the pallidum or of its efferent fibers, depth electroencephalographic study and/or production of a transitory paralysis of the pallidum by injections of procaine hydrochloride are helpful. Particularly under the influence of drugs, e.g., on awakening from barbiturate anesthesia, some of our patients with athetosis showed increased pallidal activity (Fig. 2). In a case of posthemiplegic athetosis the electric discharges of the opposite caudate nucleus were definitely reduced as compared to those of the homolateral caudate nucleus (Fig. 3). This is in agreement with the view that lesions of the striatum (caudate nucleus and putamen) induce a

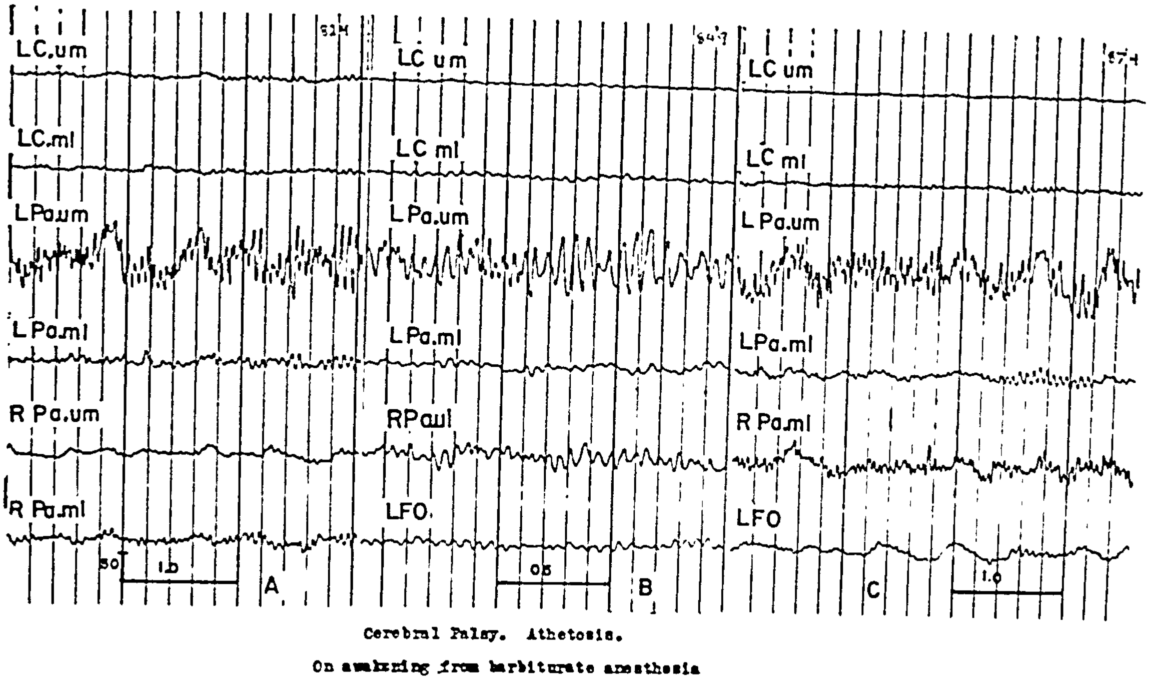


Fig. 2.—Electrogram of the basal ganglia in a case of cerebral palsy with athetosis during awakening from barbiturate anesthesia. *LC*, left caudate nucleus; *LPa*, *RPa* left and right pallidum respectively. Three electrodes are in each ganglion (*u*, upper, *m*, middle, *l*, lower electrode). *LFO*, left fronto-occipital leads. Standardization, 50 µ volts; time, 1 second in *A* and *C*, 0.5 second in *B*.

release of pallidal mechanisms that innervate certain involuntary movements ("automatisms"). Indeed, in such cases of athetosis as met the criteria of an electrographically demonstrable increased pallidal activity and/or of a beneficial effect of procaine injection into the pallidum, electrocoagulation of parts of this ganglion and of its efferent fibers (pallido-ansotomy) proved able to reduce the involuntary movements.

In addition to the innervation of some involuntary movements, the pallidum seems to emit impulses that facilitate the activity of lower reflex arcs, which maintain the *resting tremor* observed in cases of paralysis agitans and Parkinsonism. This may be inferred from observations in cases in which this type of tremor could be reduced by pallido-ansotomy. A similar effect was produced by R. Meyers, who introduced a blunt probe through the foramen of Monro into the third ventricle and incised its lateral wall in order to interrupt the fibers of the ansa lentiformis. Meyers apparently has abandoned this operation in view of its high mortality rate (20 per cent).[4] In our series of 17 cases in which lesions of the ansa were produced by a needle electrode inserted through the frontal lobe, we lost 1 patient. This patient had advanced Parkinsonism. We could not communicate with him or check his ability to perform voluntary movements during operation, because he was a deaf mute. Hemiplegia developed, and the patient died four months after the operation. This case taught us the importance of performing the ansotomy with local anesthesia, so that the effect of electrocoagulation, not only upon the tremor but upon the patient's ability to perform voluntary movements, can be continually checked. The coagulation should be immediately stopped if these movements become weaker in the contralateral extremities.

The lesions of the ansa lentiformis are made in the frontal level of the anterior commissure, 3,6 mm. and sometimes also 9 mm. behind this level, if the lesions placed more anteriorly are insufficient to reduce or abolish the tremor.

A favorable effect, i.e., a more or less marked diminution of the tremor, was obtained in 10 of the 16 surviving patients who had been unresponsive to the usual types of medication (excellent results in 5, fair results in the other 5; duration of observation, up to three years). The favorable effects were noted particularly in patients with unilateral or predominantly unilateral involvement, while the failures (no reduction or brief temporary reduction of the tremor) were observed chiefly in patients with generalized tremor.

In about one-half of the cases there was also a favorable effect upon the *bradykinesis* that occurred independently of changes in muscle tone, so that the frequency of alternating flexor-extensor movements of the fingers was significantly increased.

In some patients the *rigor* of the extremities was definitely decreased; this we were able to demonstrate objectively by recording the resistance to passive movements by means of a myotonograph.[5] The abnormal posture of the trunk could not be influenced, nor could the gait. This decrease of muscle tonus was rather unexpected, since it is known that pallidal diseases usually induce an increase of muscle tonus. In treating these diseases of the pallidum, one deals with diffuse processes that frequently also affect other parts of the extrapyramidal system (e.g., the substantia nigra), while our operative procedures produced small circumscribed lesions of the pallidum and the ansa lentiformis. This difference suggests the hypothetical explanation that the pallidum sends to the lower tonus-maintaining reflex arcs not only inhibitory but facilitating impulses and that ansotomy probably interferes chiefly with the latter. In order to reach definite conclusions as to the mechanisms responsible for the reduction of rigor following ansotomy, further studies, particularly of histologic controls of the lesions, seem necessary.

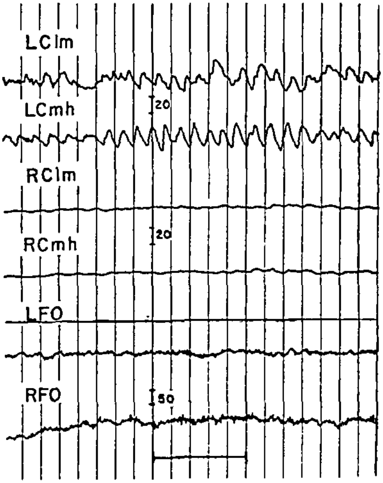


Fig. 3.—Left-sided posthemiplegic athetosis. Flat record from the right caudate nucleus (*RC*); apparently normal record from the left caudate nucleus (*LC*). Lower, middle and upper electrode, *l*, *m* and *h*. *LFO*, *RFO*, left and right fronto-occipital leads.

SUMMARY

The authors discuss the use of stereoencephalotomy in the treatment of certain types of chorea, athetosis and tremor. Small circumscribed lesions are produced in subcortical areas by electrolysis or electrocoagulation, with the aid of a guiding apparatus, the stereoencephalotome. The effects on involuntary movements and on the "resting tremor" associated with paralysis agitans and Parkinson's disease, are described. A [illegible]able eff[illegible], i.e., a more or less ma[illegible] was obtained in [illegible]

been unresponsive to the usual medication. In the authors' opinion, further studies, with histologic controls of the lesions, will be necessary before definite conclusions can be drawn.

ZUSAMMENFASSUNG

Die Verfasser erörtern die Verwendung der Stereoenzephalotomie in der Behandlung gewisser Formen von Chorea, Athetose und Zittern. Mit Hilfe eines lokalisierenden Apparates, des Stereoenzephalotoms, werden kleine umschriebene Zerstörungsherde in subkortikalen Gebieten durch Elektrolyse oder Elektrokoagulation geschaffen. Die Wirkung auf unwillkürliche Bewegungen und auf den mit der Paralysis agitans und Parkinsonscher Krankheit einhergehenden "Ruhetremor" wird beschrieben. Ein günstiger Einfluss, d.h. eine mehr oder weniger ausgesprochene Herabsetzung des Zitterns, wurde an zehn der sechszehn Patienten, die auf die üblichen Medikationen nicht ansprachen, erzielt. Die Verfasser glauben, dass, ehe endgültige Schlussfolgerungen gezogen werden können, weitere Untersuchungen mit histologischer Kontroll der erzeugten Herde notwendig sind.

RÉSUMÉ

Les auteurs discutent l'application de la stéréoencephalotomie dans le traitement de certains types de choréa, athétose et tremeur. Des petites lesions limitées sont crées dans les zones subcorticales par électrolyse ou coagulation guidé par un appareil, nommé le stéréo-encephalotome. l'effet au mouvements involontaires et au "tremeur de repos" associés à la paralysis agitans et à la maladie de Parkinson est décrit. Un effet favorable, c'est à dire une diminution du trémeur plus ou moins remarquable, fut obtenu chez 10 malades, qui survivaient et qui n'avaient pas répondu à des autres sortes de médication. Dans l'opinion de l'auteur il faudra faire plus d'études avec des contrôles histologiques des lésions, avant de pouvoir faire des conclusions défines.

RESUMEN

Los autores discuten el uso de la estereoencefalotomía en el tratamiento de ciertos tipos de corea, atetosis y temblor. Por medio de electrolisis y electrocoagulación se producen pequeñas lesiones circunscritas en áreas subcorticales, con la ayuda de un aparato, el estereoencefalotomo. Se describen los efectos sobre los movimientos voluntarios así como sobre el temblor de reposo que se presenta en la enfermedad de Parkinson y en la parálisis agitante. En 10 de los pacientes que sobrevivieron y que no habían respondido a la terapeútica habitual se obtuvo un efecto satisfactorio consistente en una disminución marcada del temblor. En la opinión del autor se necesitan controles histológicos de las lesiones antes de llegarse a conclusiones más definidas.

SUMARIO

Os autores discutem o emprêgo da estereoencefalotomia no tratamento de certas formas de coréia, atetose e tremor. Pequenas lesões circumscritas são produzidas em áreas subcorticais pela eletrólise ou electrocoagulação, com o auxílio de um aparêlho, o estereoencefalotomo. O efeito sôbre os movimentos involuntários e sôbre o "tremor de repouso" associado com paralisia agitante e a doença de Parkinson são descritos. Um efeito favorável, i.e., uma maior ou menor diminuição na intensidade do tremor, foi obtido em 10 dos pacientes sobreviventes que não tinham reagido à medicação usual. Na opinião do autor, antes de se estabelecerem conclusões definitivas, devem ser realizados estudos posteriores com um controle histológico das lesões.

REFERENCES

1. Spiegel, E. A., and Wycis, H. T.: Principles and Applications of Stereoencephalotomy, J. Internat. Coll. Surgeons 14:394, 1950.
2. Spiegel, E. A., and Wycis, H. T.: Stereoencephalotomy. New York: Grune and Stratton, 1952, part 1.
3. Spiegel, E. A., and Wycis, H. T.: Thalamotomy and Pallidotomy for Treatment of Choreic Movements. Surgical Forum, 1950, p. 329; Acta Neurochir. 2:417, 1952.
4. Meyers, R.: Surgical Experiments in the Therapy of Certain Extrapyramidal Diseases, Acta Psychiat. et. neurol. Suppl. 67, 1951.
5. Spiegel, E. A.; Wycis, H. T.; Baird, H. W.; Rovner, D., and Thur, C.: Pallidum and Muscle Tone, Neurology, to be published.

◆

The guiding circumstance of a surgeon's life is personal responsibility. He is in charge, he must make decisions and initiate or carry out the line of action those decisions imply, and on the correctness of his decisions and the skill and determination with which the action is carried out depends the welfare and possibly the life of his patient. All the material for a correct diagnosis may not be available, at any rate at a particular time, but there must always be a decision; even though it may not be the right one it is the best that can be made at the time and the one on which action must be based if action is needed.

A surgeon conducting a difficult case is like the skipper of an ocean-going racing yacht. He knows the port he must make, but he cannot foresee the course of the journey. He must be guided as he goes by changes of wind and weather, he must constantly seek help from the barometer, the lead, the look of the sky, the B.B.C. weather forecast, and he must plan his course not so much as to give the most direct journey as at all stages to avoid possible dangers. At every point he must know how far he has travelled, where he is, and the limits of error within which his projected position may lie; what dangers and difficulties lie immediately ahead; and how soon he may expect to make port. At every stage he must have a plan, based on a working knowledge of his present position, that will allow him to make for the best of several available harbors should things go wrong, or if none is suitable he must know where to find temporary refuge under the lee of the land till he can resume his journey.

—*Ogilvie*

Obstetric and Gynecologic Surgery

Extreme Hernia Uteri Gravidi Abdominalis

Report of a Case

KURT KAISER, M.D., A.I.C.S.

GLOVERSVILLE, NEW YORK

MOST malpositions or malpresentations are caused by disproportion between the fetus and the maternal pelvis or by tumors hindering the engagement of the presenting part. Deformities of the uterus, like all degrees of uterus duplex, may be responsible for breech, oblique or transverse presentations. Displacement of the uterus too may create obstetric problems. The retroflexed uterus, if it does not correct itself automatically or is not corrected, generally leads to incarceration behind the promontory and to abortion. The hyperanteflexed uterus has no chance to become incarcerated but may lead to malposition and dystocia, especially in extreme cases like the one here presented.

REPORT OF CASE

A white woman aged 37 was seen for the first time at 9 a.m. on Oct. 10, 1952, in the labor room in consultation. Her last menstruation had occurred on February 1.

The estimated date of delivery was August 11. She had been in hard labor for over twelve hours. Menstruation had started when she was 12 years of age and had been regular and normal, occurring every four weeks and lasting about six days, without pain. She had borne six children between 1939 and 1949, all normal deliveries, the first with a breech presentation. Labor had ranged from four to fourteen hours. All children were born alive and the birth weight of all was between 8 and 10½ pounds (3,629 and 4,863 Gm.). During this pregnancy the patient saw her physician only once, and she was not examined before admission. When seen lying in bed she presented a most unusual sight: the abdomen was protruding forward in an almost acute angle. When she was in an erect position the fundus of the uterus fell forward and downward, reaching the middle of the thighs. She was obese, weighing approximately 250 pounds (123.4 Kg.), with an enormous anasarca including the abdominal wall. Besides the anasarca she had a large apron of fat that made external examination very difficult, especially as the whole abdomen was extremely tender. Nevertheless a large hard fetal part was palpated in the middle of the enormous bulge of the uterus. No other fetal parts could be felt by the examining hand. A quick rectal examination proved the pelvis entirely empty, with no presenting part. The impression was that the baby stood upright on the mother's spine when she was lying in bed. This description is incorrect but best illustrates the situation. Roentgen examination verified this most unusual position. Unfortunately the roentgenograms, because of poor contrast, are not fit for reproduction. The roentgenologist described the situation correctly, referring to the mother in the erect position: "The fetus is lying horizontally, with its pelvis posterior in relation to the mother and the head extending directly forward to the anterior abdominal wall."

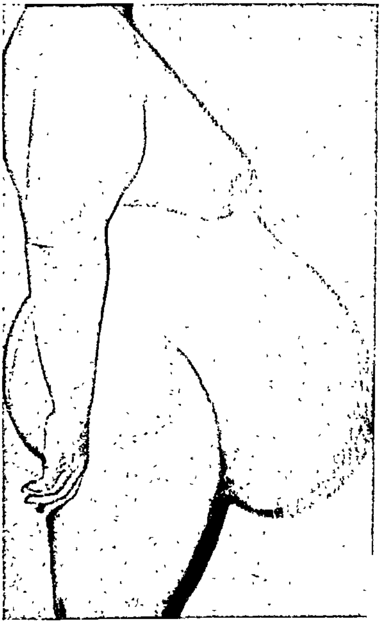
The patient's blood pressure in millimeters of mercury was 152 systolic and 94 diastolic. There was no albumin in the urine. The fetal heart tones were heard in the right upper

---

Submitted for publication July 12, 1955.

quadrant, regular but very faint. The patient was quickly given 500 cc. of 20 per cent dextrose intravenously and 2 cc. of 50 per cent magnesium sulfate intramuscularly. At 10:30 a.m. a vaginal examination was done. The pelvis was entirely empty; no presenting part was palpated. The cervix was almost entirely open but looked toward the mother's promontory. The membranes were intact. The cervix could easily be fully dilated. I therefore ruptured the membranes, grasped both legs of the child at the region above the mother's sacrum and with version-like manipulation extracted the baby by the feet. This procedure, especially the delivery of the shoulders, was a little difficult on account of the size of the baby, which weighed 11 pounds (4,089 Gm.). The baby cried well after the delivery, but in spite of pediatric attention died after twelve hours, with symptoms of atelectasis. The pediatrician called it a "premature giant child," damaged by the mother's untreated preeclampsia. The mother's recovery was uneventful. The blood pressure returned to normal, the edema subsided quickly, and she was discharged on the sixth day, October 15.

The patient was not seen again until April 29, 1955, when she came to the office in the seventh month of pregnancy. She was then 40 years old and expecting her eighth child. The most recent menstruation had occurred on Oct. 2, 1954. She presented again the same peculiar and spectacular appearance as before. The acutely angled bulge of the abdomen containing the fundus of the uterus again dropped forward and downward when she stood erect. Again there was enormous edema of the legs and abdomen. She weighed 245 pounds. (111.1 Kg.). The blood pressure at the first office examination was 200 systolic and 110 diastolic. There was a 2 plus reaction for albumin, and the value for chlorides was 534 mg. The urea content and the blood count were normal. With strict diet and rest the patient, who was very cooperative, lost some weight at home, but on May 10 she had to be hospitalized. After treatment with strict bed rest, hypertonic dextrose, magnesium sulfate and sedation, the dangerous toxemia improved so much that after a short time she was able to go home. During her stay in the hospital the photograph presented here was taken showing her already in a much improved condition. Roentgen studies were made, and this time the reverse position of the fetus was diagnosed. The roentgenogram again was not informative enough for publication. The report was as follows: "The fetus is in a horizonta and sagittal plane in relation to the mother The fetal head is posterior, near the materna spine, and the fetal buttocks are anterior, ir the region of the mother's umbilicus. Ther are no presenting parts in the maternal pelvis." The estimated date of delivery was Jul 10, but again the child seemed to be extremel large, so that it was planned to terminate th pregnancy around the thirty-sixth week. Th history of toxemia and malposition at the former delivery, with a baby weighing 11 pound and living only twelve hours, was an importan factor in making this decision. Earlier thar had been planned, however, on the night o June 3, approximately five weeks before th estimated date of delivery, she was admitted to the hospital with severe labor pains. The condition was the same; the bulging abdomen was again tender; no fetal [illegible] he



Patient with extreme hernia uteri gravidi abdominalis (see text).

pelvis, and it was decided to terminate the delivery by cesarean section. As was expected, the incision between the symphysis and the umbilicus at the height of the protruding bulge exposed the uterine fundus, and the incision there in the uterus itself immediately brought the breech into the visual field. The child was delivered through the incision by breech extraction. Its weight was 12.2 pounds (5,450 Gm.) in spite of the alleged prematurity. The extremely distended uterus of the "grande multipara," now more than 40 years old, was amputated supravaginally, the large fat apron excised and the fascia doubled. Child and mother were doing well, and on June 13 both were discharged in excellent condition.

COMMENT

I should like to enlarge upon certain details that have received only slight mention in the report of the clinical course. All terms as to the description of the position of the child are used in relation to the plane of the maternal pelvis in the erect position. Basically one may differentiate between longitudinal or vertical positions and latitudinal or horizontal positions. In the first instance the axis of the child is vertical to the axis of the pelvis, as in cephalic and breech presentations; in the second case the axis of the child is oblique or horizontal to the axis of the pelvis, as in shoulder, arm or torso presentations. The latter are definite malpositions, and a mature child cannot be delivered alive spontaneously, unless the horizontal axis of the child is transposed into the vertical position. This is done by cephalic or podalic version.

All terms as to the evaluation of the presentation of the child are used with reference to the presenting part in the parturient canal. Presentations like the one in the case here described are malpositions, in spite of the fact that one may call them correct presentations in the upper birth canal. At the first of these deliveries the child was in the uterus in breech presentation, and at the second delivery in cephalic presentation. Nevertheless a definite malposition existed, since the upper part of the birth canal itself was in a wrong position in relation to the pelvis. In other words, malposition of the whole container, instead of only the contents, was to be dealt with. Consequently the position of the container—the uterus—has to be corrected, and the contents—the child—will be automatically in the right position. That is accomplished during labor by pushing the uterus upward with every pain, by holding it with a binder or by pulling it up by a towel slung over the shoulder of the patient. Greenhill often accomplished engagement by letting the patient squat, so that her own thighs forced the uterus up. For this patient all those procedures seemed too dangerous, too slow and of too questionable value, considering the impending rupture of the uterus, the size of the babies and the coexisting toxemia. Besides, the patient, during her few office visits during her last pregnancy, had considerable pain when the uterus was held up manually. All those manipulations may not be necessary if, prophylactically, the uterus is prevented from falling forward and a binder is worn from the beginning of pregnancy. Unfortunately I never could attempt this procedure, because I did not see the patient early enough.

It is interesting that there were two different presentations, a breech and a cephalic, in the same patient with this anomaly. This condition is called "pendulous abdomen" and is caused by weakness or distention of the anterior abdominal wall.

If the diastasis of the recti muscles is as pronounced as in this case, if the whole uterus falls forward to such a degree that the fundus points downward, it is called "hernia uteri gravidi abdominalis." This weakness of the abdominal wall may be congenital or acquired. In the case just presented one may assume that the frequent bearing of very large children was mainly responsible for the tremendous diastasis of the recti. The apron of fat, by constantly pulling on the abdominal wall, certainly did not improve the condition. No other causes for this hyperanteflexion of the uterus such as deformities of the spine or the pelvis or tumors in the pelvic cavity could be discovered.

I have mentioned the best treatment, which is prophylaxis during pregnancy. Unfortunately I was not able to apply prophylactic treatment, since the patient was never seen early in pregnancy. At the time of the first of these two deliveries, the one delivery with breech presentation, I was able to correct the angulation of the birth canal by pulling the baby's legs down. Since dilatation of the cervix was complete, the delivery could be terminated at once. It should be emphasized again that this manipulation was not version of the child, even though the procedure was similar; it was version or transformation of the *uterine axis* from the horizontal to the vertical plane. The combination of severe preeclampsia, an oversized baby in malposition and an overdistended uterus was the indication for cesarean section in the second instance. The recurrence of severe toxemia in a 40-year-old woman with a pendulous abdomen and malposition, who had borne 8 children of ever-increasing size, was the indication for the Porro operation. At this time an attempt was made also to improve the condition existing in the anterior abdominal wall. To accomplish a perfect cure of the pendulous abdomen a much more extensive and time-consuming procedure than that which I performed would have been necessary, since the diastasis of the recti muscles extended from the symphysis up to the xiphoid. On account of the general condition of the patient I considered it advisable to postpone complete plastic reconstruction of the abdominal wall. I may even abstain from doing it at all, since in this patient the complications resulting from a pendulous abdomen cannot occur again, because of the supravaginal hysterectomy.

ZUSAMMENFASSUNG

Der Verfasser beschreibt zwei Entbindungen einer Mehrgebärenden mit einem Bauchbruch des schwangeren Uterus, die durch Schwangerschaftstoxikose kompliziert waren. Er erörtert den Ursprung, den Mechanismus und die Behandlung der Erkrangung.

RESUMEN

El autor describe dos partos de una "gran multípara" con hernia abdominal del utero an embarazo complicado con toxemia gravídica. Comenta el origen, el mecanismo y el tratamiento.

SUMARIO

O autor descreve dois partos de uma "grande multipara" com hernia uteri gravidi abdominalis complicados por toxemia de gravidez. Discute a origem, mecânismo, e tratamento dêste estado.

RÉSUMÉ

L'auteur décrit deux couches d'une "grande multipara" avec hernie abdominale de l'uterus gravide, compliquées de toxémie de la gestation. Il discute l'origine, le mécanisme et le traitement de cette condition.

BIBLIOGRAPHY

DeLee, J. B., and Greenhill, J. P.: The Principles and Practice of Obstetrics, 1943.

Falls, F. H.: Dystocia Due to Abnormalities of the Genital Tract. Curtis—Obstetrics & Gynecology, 1933.

Freund, R.: Uterusruptur. In Halban & Seitz VIII, 1 Biologie & Pathologie Des Weibes, 1927.

Guggisberg, H.: Geburt bei Lageveraenderungen Der Geburts Wege. Halban & Seitz, 1928, vol. 7, p. 2.

Transtympanic Mobilization of Stapes as a Treatment for Otosclerosis: An Evaluation

ALAN AUSTIN SCHEER, M.D., F.I.C.S., D.A.B.
NEW YORK CITY, NEW YORK

HAVING observed the results of transtympanic mobilization of the stapes for one and one-half years, I consider it time to make a critical appraisal of this procedure. The observations discussed in this preliminary report are derived from 215 operative cases.

The thinking behind this technic has a sound physiologic basis, and the approach is completely rational. It is based on the knowledge that the underlying pathologic change that causes the hearing loss in persons with otosclerosis is fixation of the footplate of the stapes in the oval window. It has always been assumed that this bony ankylosis, even if incomplete, could not be broken up sufficiently to allow the stapes to become mobile again. Because of this false assumption, fenestration is done to reroute sound through a newly created window in the bony labyrinth. The mobilization operation utilizes the normal ossicular conduction system to carry sound to the cochlea.

The proper exposure for the mobilization operation is obtained by reflecting the posterior half of the tympanic membrane and the contiguous skin of the auditory canal forward and over upon itself, thus exposing the incus and stapes. An attempt is then made to break up the ankylosis by rocking the stapes in its physiologic plane. At this time it has been definitely shown that stapes fixation in certain cases is reversible, and that by delicate instrumental manipulation the stapes may be mobilized and the hearing restored.

Transtympanic mobilization is not new, for as early as 1888 Kessel,[1] Boucheron,[2] Miot[3] and Faraci[4] were employing this method to mobilize the stapes through a miringotomy.

In 1953 Rosen[5] developed a new technic and special instruments for lifting up the intact drum and mobilizing the fixed stapedial footplate. He removed enough of the edge of the posterior bony canal wall to expose the entire stapes and stapedial tendon. It is basically his method that was used in the 215 cases from which are drawn all the observations in this report.

Hyaluronidase is added to a mixture of 2 per cent xylocaine (3 cc.) and epinephrine (1 cc. of 1:1000). The effectiveness of this local anesthesia thus induced goes far beyond the scope of this operation. One and one-half cc. of the solution is injected into the soft tissue at three points *just external to the bony portion of the* external auditory canal (Fig. 1). Unnecessary injection into the tragus may produce transient facial paralysis.

Read at the Twentieth Annual Congress of the United States and Canadian Sections, International College of Surgeons, Philadelphia, Sept. 12-15, 1955.
Submitted for publication Oct. 15, 1955.

Since the stapes is always in the posterior superior quadrant, the incision is made from 12 to 6 on the posterior canal wall from the roof to the floor, about 7 mm. external to the drug (Fig. 2*A*). It is always better to make the incision a little more external to the drum than necessary, rather than too close, since the skin may fray or a large part of the annular rim may be removed during this procedure. With a small elevator the skin is raised from the bony canal down to the annulus of the tympanic membrane (Fig. 2*B*). The middle ear is opened when the fibrous annulus is lifted out of its sulcus (Fig. 2*C*). The tympanic membrane is then folded over forward upon itself, which exposes the posterior half of the middle ear (Fig. 2*D*). In 25 per cent of cases there will be immediate exposure of the entire tendon of the stapedius muscle and the long arm of the incus with its attachment to the head of the stapes.

Whether or not any bony annular rim is removed depends on whether there is adequate visibility of the stapedius tendon. Exposure of the tendon is absolutely necessary to judge the mobility of the stapes, since a mobilized stapes when moved will cause shortening of this tendon. Frequently, when the drum is elevated, only the lower tip of the incus is visible, without any portion of the stapedius tendon coming into view (Fig. 2*E*). This necessitates removal of part of the posterior superior bony annular rim (Fig. 2*F*).

An attempt is made to mobilize the stapes after a delicate instrument has been applied to the anterior aspect of its neck. The accurate placement of this instrument can be accomplished only after much practice on the cadaver, for the neck of the stapes is only 1 mm. long. Rather than slide the mobilizer up and down on the anterior crura before feeling the niche in the neck of the stapes, one reverses the technic. First, the instrument is applied to the anterior portion of the incus next to its lenticular process and the incus is moved posteriorly, just slightly on the head of the stapes. The instrument is then dropped slightly deeper until it falls on the first solid part, which is the neck of the stapes. The exact location is not visible. Too deep an application will fracture the crura, and too shallow an application will separate the incudostapedial joint. After sufficient experience, direct application of the mobilizer to the neck of the stapes is possible.

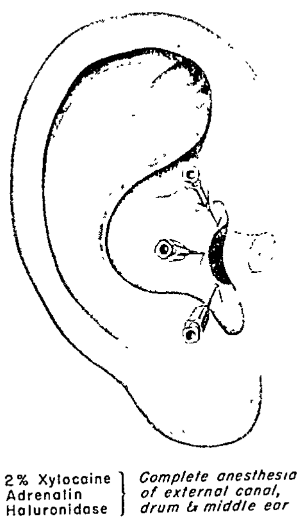


Fig. 1.—Technic of local anesthesia (see text).

A slow pulsating pressure applied by the mobilizer for short intervals is the safest type to exert. This enables the surgeon to maintain complete control of the instrument, which is vital. Certain stapes that are extremely fixed will require reapplication of the pressure twenty to thirty times before being mobilized. The most important point to remember with a strongly fixed stapes is that the same degree of pressure must be used with each application and should not be increased each time when the previous applications of the instrument have failed. This critical degree of pressure can be gained only with experience.

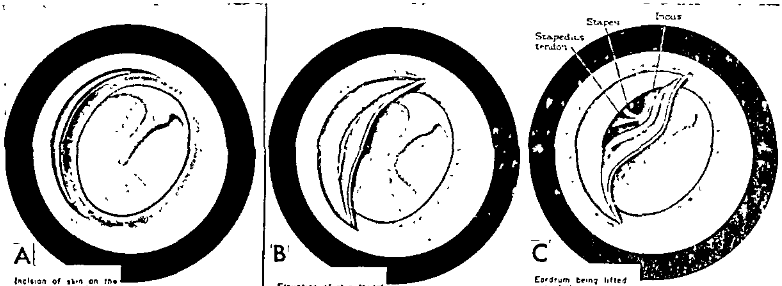
The majority of stapes that become mobilized will do so without an audible click. Some will give a dry creak and occasionally an actual click when moved. Definite stiffness is noted in the motion of some stapes after they are mobilized. Continued manipulation of these stiffly moving stapes does not always make them move any more freely. In all of the cases in this series in which maximum hearing improvement was obtained there were freely moving stapes. Patients who had a smaller degree of motion never heard as well.

After the stapes has been mobilized or its crura fractured, the tympanic membrane and the contiguous skin of the external auditory canal are replaced in their original position. It is undesirable to use any packing in the external auditory canal; and, in recent cases, sterile cotton in the outer part of the canal has replaced the mastoid dressing. The patient is advised to change the cotton as often as necessary when it becomes soiled with secretion.

There is no doubt that this transtympanic mobilization technic can restore hearing in certain cases of stapes fixation, but certainly all stapes cannot be mobilized. The wide variations in the degree of fixation and in the physical structure of the stapes are the final determining factors in the outcome of each operation. There is an entirely different "feel" to a stapes that is partially fixed from that observed with one that is completely immobile. Certain stapes that feel completely and solidly fixed will mobilize after prolonged manipulation — and, of course, others will fracture. It is difficult to visualize the mobilization of a stapes when the footplate has been to a large extent replaced by the otosclerotic process. Correct application of the mobilizer informs one whether there is any spring or "give" to the stapes, indicating partial fixation. When the stapes is too strongly fixed, the applied pressure will cause the crura to fracture next to the footplate, always with an audible click. Since the hearing of all patients accepted for surgical treatment is below the 30-decibel level, fracture of the crura will not aggravate the hearing loss.

In the present series the stapes in a few cases of advanced fixation seemed to be rotated forward, so that the posterior pole of its footplate was probably lifted slightly out of its normal position in the oval window. This seems evident, because when one of these firmly fixed stapes becomes mobilized its head shifts back into an entirely new position, in which it remains. The shifting of a fixed stapes occurs suddenly, and extreme control of the instrument is required to prevent its avulsion from the oval window. It is in this new position that the hearing is restored. This is only a clinical observation.

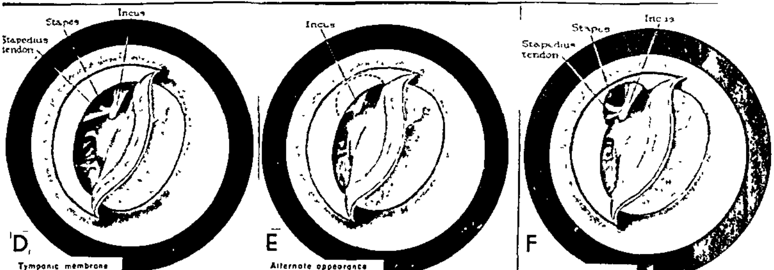
It is important to be able to estimate preoperatively the degree of fixation, since this will help in establishing the probability of successful mobilization. The audiogram, though it is extremely helpful in diagnosing otosclerosis, has little value in determining the probability of successful mobilization if the air conduction loss exceeds 40 decibels in the lower frequencies. This statement is made because the degree of stapes fixation is not always in direct proportion to the hearing loss. In the



A Incision of skin on the posterior wall of the external auditory canal

B Elevation of skin toward tympanic membrane

C Eardrum being lifted out of the annular sulcus



D Tympanic membrane folded forward exposing the middle ear Fixed stapes ready to be mobilized

E Alternate appearance of the middle ear where bony annular rim covers ossicles Dotted lines indicate bony area to be removed

F Bony annular rim removed with with curette exposing fixed stapes

Fig. 2.—Technic of operation.

same person with an equal bilateral loss, one stapes can be immovable and the other only moderately fixed. There is no correlation between the age of the patient or the duration of the hearing loss and the degree of stapes fixation.

The following pertinent facts justify mention:

1. When the result of the Rinne test was negative with the 512 fork, but it was still equal (AC = BC) with the 1024, it was observed that the stapes was not completely fixed and could usually be mobilized.
2. If the result of the Rinne test was negative with the 512 and 1024 forks, but the patient could hear a loud voice at five feet, the stapes would usually be firmly fixed. Fifty per cent of such fixed stapes can be mobilized. This is certainly not a hard and fast rule, however, for in many cases with these negative Rinne responses there is only partial fixation of the stapes.
3. If in the presence of a negative Rinne response with the 512 and 1024 forks the patient cannot understand extremely loud conversation beyond a distance of two feet, the stapes will be too firmly fixed to mobilize.
4. Patients who cannot hear without their hearing aid have a stapes that is usually too firmly fixed.

The cases in which the greatest percentage of good results is obtained are those in which there is a negative Rinne response with the 512 fork, but air and bone conduction are still equal with the 1024 fork.

No complications resulting from this operation have occurred in the 215 cases. The stapes was never avulsed. After mobilization there has been occasional labyrinthine vertigo, accompanied by nystagmus lasting three to four minutes. Thirteen traumatic perforations were produced during the process of elevating the annulus out of its sulcus. Eleven of these perforations healed spontaneously. Nine minor postoperative infections developed, all of which were controlled with antibiotics. It is important to remove all the bony spicules from under the flap, since these will act as sequestra. Involvement of the facial nerve has been completely avoided, since all of the curetting is done external to the level of the stapedius tendon.

Results.—Observations have been made on 215 operative cases. The results of the first 100 cases will be reviewed since the patients have been followed for ten to eighteen months and the data on them are therefore significant:

1. Ninety-seven stapes were fixed at the time of operation, and 3 were mobile.
2. Thirty stapes had their crura fractured.
3. Sixty-seven stapes were successfully mobilized.

The cases in which mobilization was achieved can be divided into two groups: Group A, in which there is marked improvement in hearing, and Group B, in which there is little or no gain. For a case to be classified in Group A, all the speech

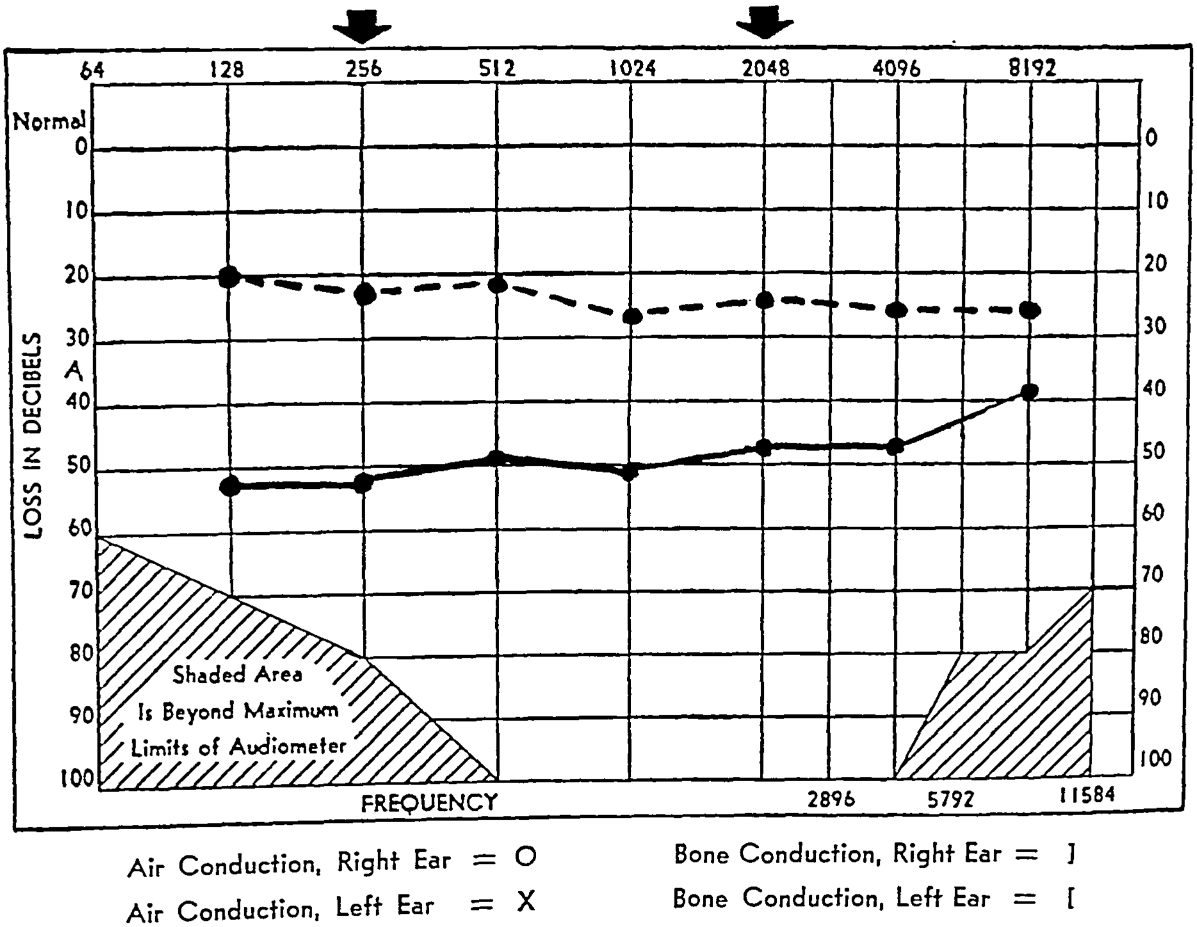


Fig. 3.—Average preoperative and postoperative audiogram.

frequencies must be at or above the 30-decibel level. Thirty-three of the cases fall into Group A and 34 into Group B.

The air conduction in 13 of the 33 cases in Group A reached the preoperative bone conduction level. In the 20 remaining in Group A there was marked improvement above the practical 30-decibel level, but the air conduction did not equal the bone conduction.

The composite average preoperative and postoperative audiogram of the 33 cases in Group A is shown in Fig. 3. From this it can be shown that the average decibel improvement in each frequency is as follows:

128	256	512	1024	2048	4096	8192
33 db.	29 db.	27 db.	25 db.	23 db.	20 db.	12 db.

The return of hearing in the operating room to the patients of Group A was often dramatic. As soon as the stapes was mobilized these patients noted an increase in the loudness of the spoken voice and various noises in and outside the room. It was an emotional moment for many of the women. Several patients who spoke with very low voices before the return of their hearing were noted to have an increased volume in their speech immediately after the procedure.

At the time of this preliminary study, the reason for failure to obtain a greater hearing improvement in the Group B patients with mobilized stapes can only be conjectured. It is reasonable to think that if a stapes has been fixed about a large portion of the perimeter of the footplate, the irregularity of the fractured area (if it actually is a fracture) would prevent its normal movement within the oval window. If the annular ligament or footplate had been replaced to any extent by the otosclerotic process, the stapes could not be expected to vibrate normally unless the fracture line through the otosclerotic process was linear and regular in type or the area of disease causing the fixation was small.

If clinical improvement in hearing was obtained, it was always noted at the time of the operation. The maximum audiometric improvement was always obtained within five days unless a clot remained in contact with the tympanic membrane.

Of the 33 patients in Group A, 28 have maintained their original hearing improvement for a period varying from fourteen to eighteen months. Four have had a sufficient drop to offset all of the original gain.

In the 4 patients whose hearing returned to the preoperative level, this occurred within a month. In 1 ear a postoperative infection developed under the skin flap and the loss was quite rapid. The hearing did not return when the infection cleared.

The 4 patients in Group A whose hearing dropped to the preoperative level after successful mobilization underwent revisions. The same surgical procedure was done. The skin of the posterior canal wall can be elevated more easily the second time, because it is slightly thicker and not as adherent to the underlying bone. The drum folds forward more easily, because the annulus does not have to be lifted out of its sulcus. Since all the bony annular rim necessary for the proper exposure has been removed at the original operation, the secondary procedure becomes simpler. In the 4 cases of revision there was recurrence of stapes fixation, and in all but 1 the stapes was as firmly fixed as at the original procedure. All could be remobilized. The hearing in each case was returned to approximately the level attained with the first mobilization. One of these ears has undergone two revisions, but the Group A hearing improvement obtained was completely lost within two weeks after each procedure.

In 10 cases in which t i

bilization had failed because the stapes was fractured, the operation was attempted on the opposite ear. In 3 cases it was again unsuccessful, because the stapes were too fixed and therefore were fractured. In 7 cases mobilization was successful, producing 3 Group A results and 4 Group B results.

A fenestration was performed on 1 patient who had undergone bilateral mobilization without success (fractured stapes). Fenestration was performed on the ear nine weeks after the mobilization, at which time the skin of the external canal was completely healed and the drum had a normal luster. No unusual difficulty was encountered in preparing the tympanomeatal flap, or at any time during the procedure. A satisfactory improvement in hearing has been maintained for one year. Despite the fact that only 1 fenestration has been performed after an unsuccessful mobilization, it is my opinion that other cases should not differ, provided the tympanic membrane is intact and the skin of the external canal completely healed.

Several patients in this series had bone conduction near the 30-decibel level in the middle frequencies and occasionally below this at the 2048 frequency, yet they were able to enjoy enough hearing improvement to make a tremendous difference. This potentially comprises a large group of patients who before this had no alternative except a hearing aid, since a satisfactory result could not be obtained by fenestration.

CONCLUSIONS

Transtympanic mobilization of the stapes has been so devised that it can be used as an adjunct to the present-day surgical therapy of otosclerosis. Through this technic it has been learned that partial fixation of the stapes is often reversible. In a series of 100 cases, 33 per cent of the patients obtained a hearing improvement up to or above the practical 30-decibel level in the speech frequencies. Eighty-one per cent have maintained this gain for twelve to eighteen months.

The tinnitus of those patients who obtained a Group A result (marked improvement in hearing) was greatly diminished or, more frequently, disappeared entirely.

There is difficulty in determining the degree of stapes fixation prior to operation, since there is frequently no correlation between it and the amount of hearing loss. Tuning forks may be of some value here.

It has also been shown that a successful fenestration can be performed after an unsuccessful mobilization.

SCHLUSSFOLGERUNGEN

Die transtympanische Mobilisierung des Steigbügels ist so ausgearbeitet worden, dass sie sich als Hilfsmittel in der modernen chirurgischen Behandlung der Otosklerose verwenden lässt. Diese Technik hat gezeigt, dass eine partielle Fixierung des Steigbügels oft reversibel ist. 33 Prozent einer Krankenserie von 100 Fällen erreichten eine Verbesserung des Hörvermögens über das praktisch ausreichende Niveau von 30. Decibels im Bereich der Sprachfrequenz. 81 Prozent dieser Kranken behielten ihren Hörgewinn 12 bis 18 Monate lang.

Das Ohrenklingen der Kranken, die einen als mit Gruppe A bezeichneten Hörgewinn erzielten, war erheblich herabgesetzt oder verschwand, was noch häufiger vorkam, völlig.

Es ist schwierig, vor der Operation den Grad der Steigbügelfixierung zu bestimmen, da er häufig in keiner Beziehung zum Umfang des Verlustes der Hörfähigkeit steht. Stimmgabeluntersuchungen können aber eine gewisse Hilfe bieten.

Es hat sich herausgestellt, dass nach einem erfolglosen Mobilisierungsversuch

eine erfolgreiche Fensterungsoperation ausgeführt werden kann.

CONCLUSIONS

La mobilisation transtympanique de l'étrier est tellement établie, qu'elle peut être regardée comme aide dans la therapeutique présente de l'otosclérose. Par cette technique on a appris, que la fixation de l'étrier est souvent reversible. Dans une série de 100 cas 33% des patients ont obtenu un amélioration de l'ouie jusqu'à, ou au dessus du niveau des 30% de fréquences pratiquement perceptibles. 81% ont mintenu ce gain pendant 12 a 18 mois.

Le tinnitus des malades, qui obtinrent un résultat de groupe A fut fort diminué et plus souvent il disparut complètement.

La difficulté est de déterminer le degré de fixation de l'étrier avant l'opération, puisque souvent il n'est pas proportionel au degré de la perte de l'ouie. l'usage des diapasons sera peut être d'une certaine valeur.

On a aussi trouvé, qu'on peut obtenir de bon succès d'une fenestration après avoir eu du mauvais succèe d'une mobilisation.

CONCLUSIONI

La mobilizzazione transtimpanica della staffa è stata ideata in modo da poter trovare impiego nella terapia chirurgica dell' otosclerosi. Si è imparato che la fissazione parziale della staffa è spesso reversibile. In una serie di 100 casi, il 33% dei malati ha ottenuto un miglioramento della funzione uditiva; l'81% di essi ha conservato tale miglioramento per un periodo da 12 a 18 mesi.

I ronzii auricolari diminuirono grandemente o scomparvero del tutto nei malati del gruppo A.

Vi è una certa difficoltà nello stabilire preoperatoriamente il grado di fissazione della staffa poichè spesso non vi è nessun rapporto fra questo data e la diminuzione dell'udito.

E' stato anche dimostrato che è possibile eseguire con successo una fenestrazione dopo aver fatto una mobilizzazione senza risultato.

REFERENCES

1. Kessel, J.: Ueber das Ausschneiden des Trommelfelles und Mobilisieren des Steigubugel, Arch. F Obrenbl. 11:199, 1876.
2. Boucheron: La Mobilisation de L'etrier., Bull med. 2:1225, 1888.
3. Miot, C.: De La Mobilisation de L'etrier., Rev. de Laryngol. 10:49;83:113 and 145:200, 1890.
4. Faraci, G.: Importanza acustica e funzgionale della Mobilizzazione della Staffa; Risultati di una nuova serie di operazioni, Arch. Ital. di Otol. 9:209, 1899.
5. Rosen, S.: Mobilization of the Stapes to Restore Hearing in Otosclerosis, N. Y. State J. Med. 53:2650-2653, 1953.
6. Scheer, A. A.: Restoration of Hearing in Otosclerosis by Transtympanic Mobilization of the Stapes, Arch. Otolaryngol. 61:513-534, 1955.

◆

I have spoken of liberty as a good, but it is not an absolute good. We all recognize the need to restrain murderers, and it is even more important to restrain murderous states. Liberty must be limited by law, and its most valuable forms can only exist within a framework of law.

—*Russell*

Condylectomy for Metatarsalgia: Indications and Results

HARVEY E. BILLIG JR., M.D., F.I.C.S.
LOS ANGELES, CALIFORNIA

METATARSALGIA is a term applied to pain, due to various causes, in the fore part of the foot, with or without radiation into a toe.

The type of metatarsalgia to be discussed in this paper is localized pain, aggravated by weight bearing, in the area of the plantar aspect of one or more metatarsal heads, accompanied by a localized plantar callus.

The callus is frequently mistaken for a plantar wart (verruca plantaris), as has been pointed out by Du Vries[1] of Chicago. The mechanism of its production is that of fibrous tissue proliferation and cornification over the spurlike plantar projections of the two bony plantar condylar extensions of the joint surface of the metatarsal head in the groove between which the long flexor tendon runs to the toes. The condyle on the fibular side is usually the more prominent and hence more commonly involved.

A great deal of discussion has arisen as to whether these are plantar warts or calluses over the projecting condyles. Du Vries[2] has reported follow-ups on a number of cases in which surgical removal of the projecting condyles, without special attention to the callus itself, has resulted in prompt elimination of the metatarsalgia and disappearance of the callus.

There are several factors supporting the thesis that these are callus formations rather than verrucae.

1. The thickening and cornification tend to occur directly over the plantar surface of the condyles, and the patient complains of pain in the same location on weight bearing or deep palpation.

2. Pathologic sections of the area reveal no specific histologic changes other than those secondary to intense callus formation. Grossly the central area, with its cauliflower-like appearance and/or its suggestion of necrosis, does resemble a wart. Histologically, however, its appearance is that of fraying fibrous tissue and necrosis due to a poor central blood supply secondary to intense callus formation. Similar central fraying and necrosis are often seen in neglected bunions and in calluses over exostosis of the head of the first metatarsal.

3. The condition is frequently observed in persons with mechanical malalignment causing an increase thrust on the plantar condyles, ascribed to (a) poliomyelitic deformities; (b) arthritic deformities, and (c) malfunction of the feet due to the wearing of incorrect shoes and walking on nonresilient surfaces.

In walking or running, the stabilizing muscles of the ankle hold their position,

---

From the Billig Clinic, Los Angeles.

Read at the Twentieth Annual Congress of the United States and Canadian Sections, International College of Surgeons, Philadelphia, Sept. 12-15, 1955.

Submitted for publication Oct. 29, 1955.

plantar flexion of the toes being supposed to give the forward thrust of the "take-off." Owing to the conformation of the shoes and/or weight bearing on a non-resilient surface, the toes cannot exert the plantar flexion required to perform this function, so the forward thrust becomes plantar flexion of the foot only, forcing the plantar condyles of the metatarsal heads sharply against the sole of the shoe with every step. The kinetic sequence has been well analyzed by Prof. Laurence E. Morehouse[3] (University of California at Los Angeles), who has developed a "ripple sole" to allow toe to function properly.

4. A comparable example of callus formation may be observed in the hand of a ditch digger, in which the constant pressure of the shovel handle on the palmar surface over the metacarpal heads produces exceedingly thick overlying calluses. The thick calluses developing over tendon sesamoid of the great toe, the medial aspect of the exostosis of the head of the first metatarsal (bunion), the so-called tailor's bunion, the callus over the dorsum of the joint in cases of hammer toe, and calluses appearing wherever there is constant outside pressure friction irritation (e.g., from the shoe) are all examples of the same protective measures taken by the body in attempting to wall off and guard the underlying structures from injury. Unfortunately, owing to weight bearing, the callus on the sole over the condyles only aggravates the situation. Removal of the offending bony projection, the condyle, eliminates the pressure point in just the same way as does removal of the bony exostosis underlying a bunion. It is well recognized that the bunion callus need not be removed; it will disappear by itself once the underlying bony projection is eliminated.

In line with the general tendency of the body to protect these areas from pressure friction, bursae and/or sesamoids develop

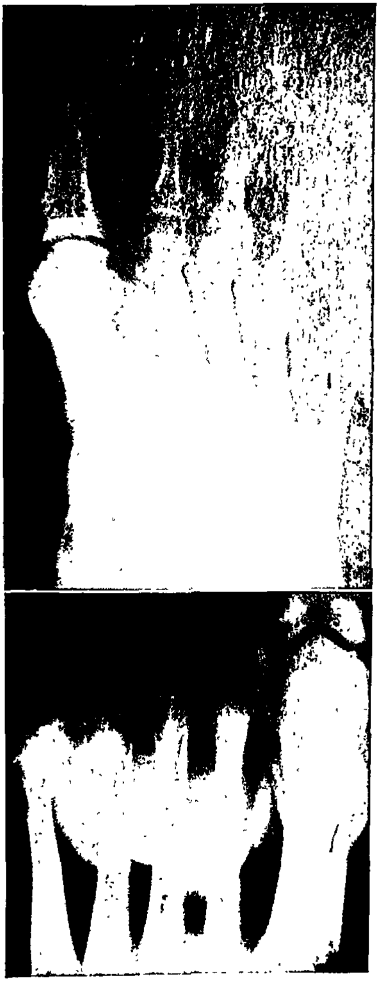


Fig. 1.—Preoperative views, showing depressed contour of third metatarsal bo[illegible]n a case of m[illegible]ia

wherever undue pressure friction occurs.

Verrucae are highly vascular and occur only incidentally over a weight-bearing surface point.

Excision of the plantar condyles may be carried out through either a dorsal or a plantar incision.

In the dorsal approach, a longitudinal incision is made over the metatarsal phalangeal joint, the extensor tendon is retracted to the side and a longitudinal incision is made in the capsule. The capsule is reflected and retracted to either side, so as to expose the head of the metatarsal. Then, with the surgeon's thumb in the sole pressing dorsally on the metatarsal head, the toe is dislocated plantarward at the metatarsal phalangeal joint. This exposes the surface of the condyles curving plantarward from the distal joint surface of the head. A sharp osteotome is then placed at the juncture of the condyles and their continuance as the joint surface of the head and is angled parallel to the metatarsal shaft. A single sharp mallet blow to the osteotome will neatly "knock off" the condyles, which may then be picked out of the wound. The dislocation of the toe is then reduced and the capsule and skin sutured.

In the plantar approach, a 3-inch (1.9 cm.) longitudinal incision is made over the metatarsal proximal to the condyles. A ½ inch (1.2 cm.) sharp osteotome is then inserted with the blade parallel to the shaft and worked under the flexor tendon next to the bone; then the osteotome is turned 90 degrees and the cutting edge slid distalward along the metatarsal shaft until it impinges on the condyles where they join the shaft. The osteotome is then angled as closely parallel to the shaft as will be allowed by the position of its handle against the heel. Again a sharp blow to the osteotome with the mallet will neatly "knock off" the condyles, which may then be picked out of the wound, any remaining capsular attachments being severed in the usual manner with the tips of curved scissors. Except for the initial incision to allow insertion of the osteotome, the operation is carried out "blind."

This operation is very simple, allows immediate ambulation, can be carried out as an office procedure with local anesthesia, does not disrupt the metatarsal phalangeal joint and enables patient and surgeon to avoid the more radical procedures (e.g., removal of the metatarsal head) with their additional disturbances of weight bearing.

A typical case was that of a 37-year-old man with a twenty-year history of "pap" under the third metatarsal head. This had been treated by several physicians successively, by cautery, desiccation, excision of the "pap" and roentgen therapy (two treatments of 300 roentgens each). Figure 1 is a preoperative film showing the depressed contour of the third metatarsal bone. Figure 2 is a postoperative film taken with the patient standing and the toes maximally dorsiflexed so that the metatarsal heads are "stubbing" into the roentgen plate placed on the floor. The roentgen beam was directed downward past the sole of the heel, thus showing the condyles of the metatarsal head in bold relief. Condylectomy of the third metatarsal head was performed. Figure 3 is a postoperative film in contrast to Figure 2. Postoperatively the patient was up and walking the second day, stating that the "sore spot" was gone, and within eight weeks the "pap" had completely disappeared.

His case is typical of the many in which this operation has been done since it was established several years ago as a part of the routine at the Billig Clinic. Reports of operative results by surgeons who were taught this technic in postgraduate courses in surgery of the foot, presented by the Billig Clinic have been enthusiastic, and

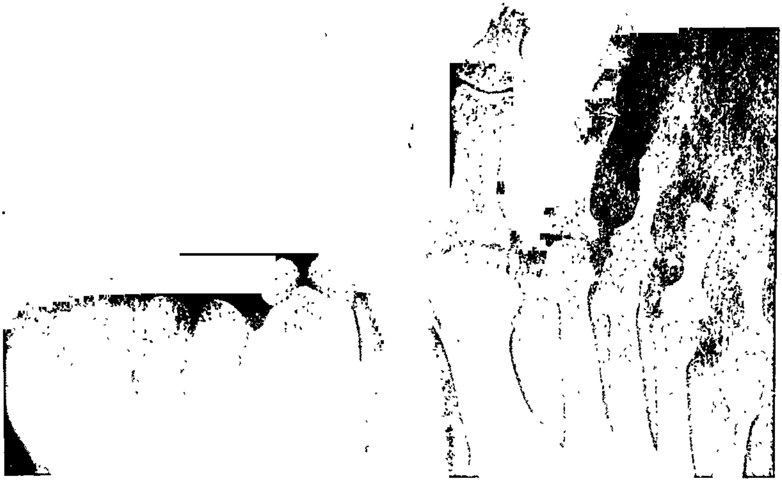


Fig. 2.—Postoperative views (see text).

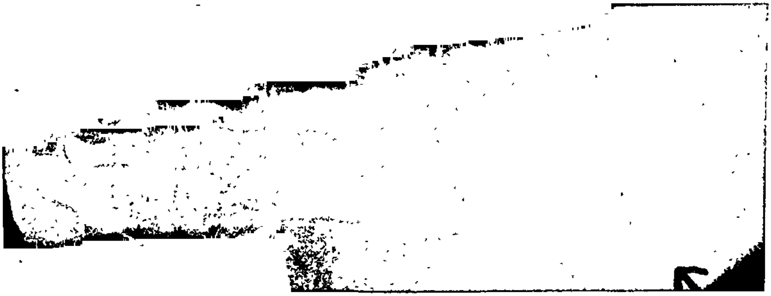


Fig. 3.—Postoperative film in contrast to Figure 2.

the cases are now being documented to add to the series and will be reported in detail later.

It has been mentioned in the discussion of etiologic factors that poor foot posture and/or walking on nonresilient surfaces will cause a sharp abnormal thrust of the condyles of the metatarsal heads into the shoe in the forward thrust take off in walking or running, and that careful examination of these patients revealed abnormal use of the foot in attempts to relieve this pressure. The postoperative course of healing has been greatly improved by routine use of the anterior metatarsal bar on the shoe (Fig. 4), which

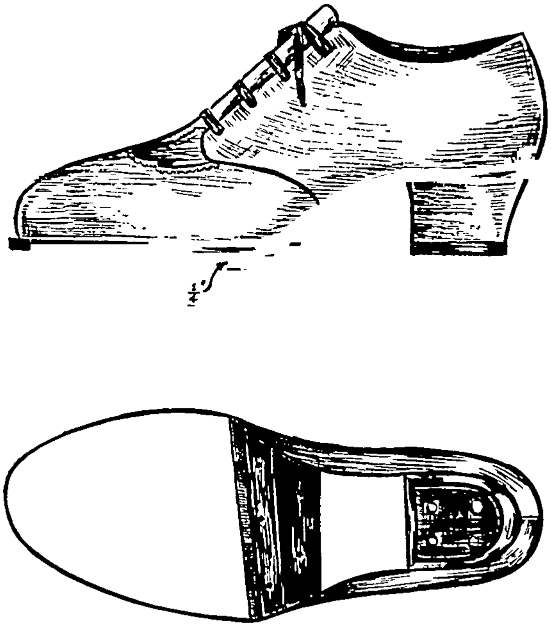


Fig. 4.—Corrective shoes (see text).

aids in correcting the distorted posture and allows restoration of the proper take-off position of the toes, thus relieving the condyles of abnormal pressure. In several operative cases in which the anterior metatarsal bar on the shoe was not used, it was observed that, although the metatarsalgia and callus over the condyles of one metatarsal head had been relieved, there developed a similar condition over the condyles of an adjacent metatarsal head. This has been prevented in all recent cases by routine addition of the anterior metatarsal bar on the shoe for six months after the operation.

COMMENT

Characteristic symptom-producing developmental variations of bony structure, notably of the lower part of the back and of the feet, have received considerable attention.

The problem of varus of the first metatarsal in the atavistic or prehensile type of splayfoot has been solved by realignment of this bone to bring its distal portion into line with the other metatarsals, as advocated by Billig[4] and Lapidus.[5] McKeever[6] corrects the relatively longer metatarsal[7] with its protruding condyles by shortening the metatarsal and resetting its head backward and angled slightly dorsal to its original position. As has been pointed out by Compere,[8] the offending plantar prominence of the condyles (Fig. 1) may really be due to an abnormal developmental plantarward contour of the metatarsal bone. This can best be corrected by angulation osteotomy[4] near the base of the metatarsal. Compere[8] has corrected the abnormal contour of the metatarsals in such instances by wedge osteotomy at the base, with satisfying results, and has emphasized the fact that all the offending metatarsals in any given foot should be corrected at the time of operation; otherwise the uncorrected condyles will have to bear the brunt of the additional pressure, and symptoms will be produced.

Condylectomy, a comparatively simple operation, nevertheless is sufficient in many instances to give satisfactory relief, without the necessity of resorting to angulation osteotomy.

SUMMARY

1. The type of metatarsalgia due to abnormal pressure of the condyles of the metatarsal head is defined.

2. Differential diagnoses between verruca vulgaris and plantar callus is discussed.

3. Surgical excision of the plantar condyles of the metatarsal heads by a dorsal or ventral approach, as palliative treatment for removal of the abnormal pressure point, is described.

4. Postoperative results are indicated.

5. Restorative kinetic pedal function aided by anterior metatarsal bar on the shoe for six months after the operation is advised.

ZUSAMMENFASSUNG

1. Die Form des Mittelfuss-Schmerzes, die durch abnormen Druck auf die Gelenkhöcker des Metatarsalkopfes hervorgerufen ist, wird erklärt.

2. Die Differentialdiagnose zwischen der gewöhnlichen Warze und der Kallusbildung der Fussohle wird erörtert.

3. Die chirurgische Resektion der plantaren Gelenkhöcker des Metatarsalkopfes auf dorsalem oder ventralem Wege als palliative Behandlung zur Entfernung des unnormalen Druckpunktes wird beschrieben.

4. Die postoperativen Ergebnisse werden dargelegt.

5. Zur Wiederherstellung des normalen Bewegungsmechanismus des Fusses wird die Zuhilfenahme einer vorderen Metatarsalschiene, die für die Dauer von sechs Monaten nach der Operation am Schuh angebracht ist, empfohlen.

RESUMEN

1. Se define el tipo de metatarsalgia producido por la presión sobre los cóndilos metatarsianos.

2. Se dicute el diagnóstico diferencial entre verruga vulgaris y callo plantar.

3. Se describe la extirpación quirúrgica de los cóndilos de las cabezas de los metatarsianos por la vía dorsal o ventral, como tratamiento paliativo para eliminar el sitio de presión anormal.

4. Se señalan los resultados postoperatorios.

5. Se recomienda la restauración de una función pedálica quinética por medio de una barra que se coloca en el zapato durante un tiempo de seis meses después de la operación.

RÉSUMÉ

1. Le type de metatarsalgie, causée par une pression anomale sur les condyles de la tête metatarsale est défini.

2. Le diagnostic différentiel de verruca vulgeris et callus plantaris est discuté.

3. L'excision chirurgicale des condyles plantaires de la tête metatarsale par une incision dorsale ou ventrale est décrite comme traitement paliative de la pression anormale.

4. Les résultats postopératoires sont exposés.

5. On recommende la restoration de la fonction kinetique du pied aidée par un renforcement metatarsale anterieur sur le soulier pendant 6 mois après l'opération.

SUMARIO

1. O tipo de metatarsalgia devido a pressão anormal sôbre os côndilos da cabeça metatársica é definido.

2. São discutidos os diagnósticos diferenciais entre verruca vulgaris e callus plantar.

3. A excisão cirúrgica dos côndilos plantares das cabeças metatársicas por via dorsal ou ventral, como tratamento paliativo para remover o ponto de pressão anormal, é descrita.

4. Os resultados pós-operatórios são indicados.

5. A função pedalar cinética restaurativa auxiliada por barra metatársica anterior no sapato durante seis meses após a operação é aconselhável.

REFERENCES

1. Du Vries, H. L.: New Approach to the Treatment of Intractable Verruca Plantaris (Plantar Wart), J.A.M.A. 152:1202 and 1203 (July 26) 1953.

2. Du Vries, H. L.: Verruca Plantaris, J.A.M.A. 154:1302 (April 10) 1954.

3. Hack, N. and Morehouse, L. E.: Analysis of *Foot Action and Ripple Sole Dynamics in Walking*; A 16 Mm. Sound Motion Picture. Film Library, University of California, Los Angeles, California.

4. Billig, H. E. Jr.: Angulation and Rotation Osteotomy: A Nonshortening, Nondisplaceab

Telescoping, Impaction Type of Osteotomy, J. Internat. Coll. Surgeons 18:495-497 1952.
5. Lapidus, P. W.: Operative Correction of the Metatarsus Varus Primus in Hallux Valgus, Surg., Gynec. & Obst. 58:183, 1934.
6. McKeever, D. C.: Arthrodesis of the First Metatarso-phalangeal Joint for Hallux Valgus, Hallux Rigidus, and Metatarsus Primus Varus, J. Bone and Joint Surg. 34-A:129, 1952.
7. Morton, D. J.: The Human Foot. New York: Columbia University Press, 1942. Morton, D. J.: Human Origin; Correlation of Previous Studies of Primitive Feet and Posture with Other Morphologic Evidence, Am. J. Phys. Anthrop. 10:173, 1927. Morton, D. J. and Fuller, D. D.: Human Locomotion and Body Form. Baltimore: The Williams and Wilkins Company, 1952.
8. Compere, E. L.: Personal communication.

◆

With perfect gentleness and prodigious patience, with the rubber gloves and new methods, Halsted extended the range of his operations. He removed cancer of the breast with much greater permanent success than had ever been achieved before. He repaired hernias, and those repairs lasted until the end of the patient's life. He had a special fascination for aneurysms, those balloon-like swellings which grow upon large arteries, caused by weakness in the layers of its wall which pulsates with each beat of the heart, and are filled with a tiny whirlpool of blood and which may burst and cause rapid death. Halsted invented new ways of tying them off and causing the aneurysm to disappear.

Once, in the middle of the night and without assistance, he operated upon his own mother for gallstones, and prolonged her life by two years. That was surely a test for a man and a surgeon, and like every other operation that he performed, it engaged his organized faculties and roused the love that lay in the very touch of his fingers.

This perfectionist in the operating theater, this neurotic in his social life loved to direct and discipline the careers of his pupils, to evoke their potentialities and rouse in them pure devotion to the science of surgery, making it almost a religious cult. "We wish to have men who have learned to work for truth's sake, who find in work and the search for truth their greatest reward," he said. Posterity honors Halsted, but those who worked near him had mixed feelings towards their inscrutable chief. They dreaded the sidelong squint of his myopic blue eyes, the soft silky voice which conveyed blistering sarcasm. His personality seemed to be surrounded by a dense vacuum. He would peer at people like a wary animal. Deliberately, he would take out a cigarette, but never offer one, and then light it slowly without speaking, as though giving himself time to sharpen his claws.

—*Williams*

Plastic and Reconstructive Surgery

Homogenous Knee Meniscus in Otoplasty

A Clinical-Pathologic Study

THOMAS RAY BROADBENT, M.D., F.A.C.S., F.I.C.S.
SALT LAKE CITY, UTAH

CONSTRUCTION of the external ear is difficult and in many instances a most unsatisfactory procedure. The majority of reconstructed ears lack detail, often gross configuration and proper positioning. The purpose of this report is to present the clinical and pathologic study of 12 cases of total or subtotal ear reconstruction, with use of the knee meniscus as the supporting framework. The reader is referred to the literature for other methods of supplying the framework for ear reconstruction.[1] Frequent failure in this task has led some to prefer prostheses over operation.[1e] One always strives for a better supporting framework that will allow construction of an ear with greater detail in a minimum of operative procedures. In general, one first supplies a hairless auricular area; sculptured cartilage is buried beneath the skin, and the new ear is mobilized from the head.

At all times, the desire and compulsion to save and utilize healthy tissue prompted the storage and preservation of the knee

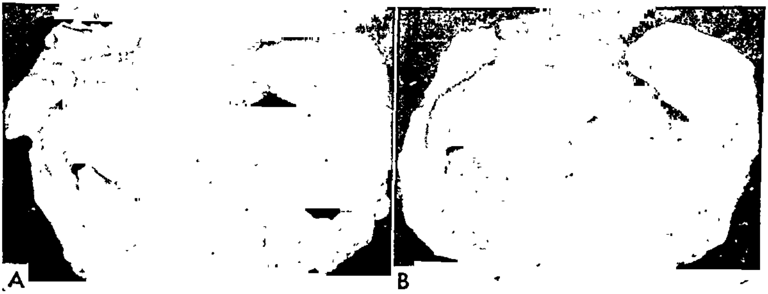


Fig. 1.—*A*, fresh homogenous knee cartilage. There being no pericondrium on this fibrocartilage, the connective tissue that is often removed is bulky. *B*, *menisci shown in A after removal of the attached connective tissue and fat.*

From the Department of Surgery, University of Utah School of Medicine, Division of Plastic Surgery, and the Latter-day Saints Hospital, Salt Lake City, Utah.

Read at the Twentieth Anniversary Congress of the International College of Surgeons, Geneva, Switzerland, May 23-26, 1955.

Submitted for publication July 11, 1955

meniscus so leisurely discarded by the orthopedic surgeon. Study of these cartilages and particularly of their gross configuration stimulated their use in total and subtotal reconstruction of the ear. The study here reported was begun three years ago, and early enthusiasm equaled that of Mir y Mir, as reported in 1952.[2]

Method of Study.—Twelve cases of total or subtotal reconstruction of the ear are included in this study. All cases represent unilateral reconstruction on male patients —10 white and 2 Navajo Indian. Ears that were medium-sized or small, or with only curled or lopped abnormalities, are not included. Knee menisci (fibrocartilage) obtained fresh in 3 instances, and preserved in 1:4,000 aqueous merthiolate for six months in 6 cases and for one year in 3, were used as the supporting framework of the ear. In 4 of the 12 cases the cartilage, stored for six months in 3 instances and obtained fresh in 1, was inserted into a subcutaneous abdominal tunnel. These, and 5 other cases of abdominal implants not carried to completion, established the observation that the changes in the implants were grossly and microscopically alike, whether placed first in the abdomen or the mastoid area. This was to be expected, since freedom from scarring and relatively equal vascular conditions exist in the two areas. The cartilage was placed directly into the mastoid area in 8 of the 12 cases. The hairy area was not replaced with a free full-thickness graft before implantation, in order to maintain vascular conditions equal to the abdominal site. At the end of two and three months the cartilage in the abdominal wall was removed, subjected to biopsy and transferred to the mastoid area. The cartilages in the mastoid area were mobi-

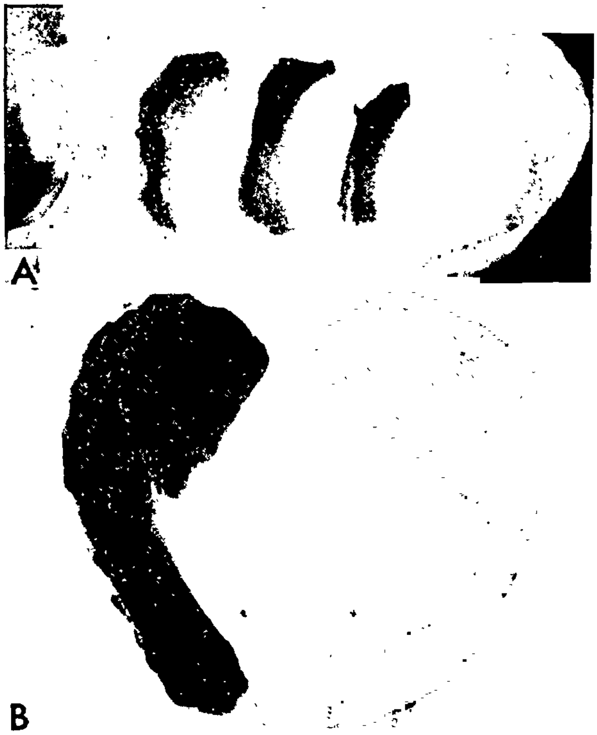


Fig. 2.—*A*, varying sizes of cartilage, with differences in form and curvatures suitable for reconstruction of either the right or the left ear. *B*, knee cartilage (fibrocartilage) stored in 1:4,000 aqueous merthiolate at ordinary refrigerator temperature. Over a period of eighteen months the gross form, size and resiliency are not changed.

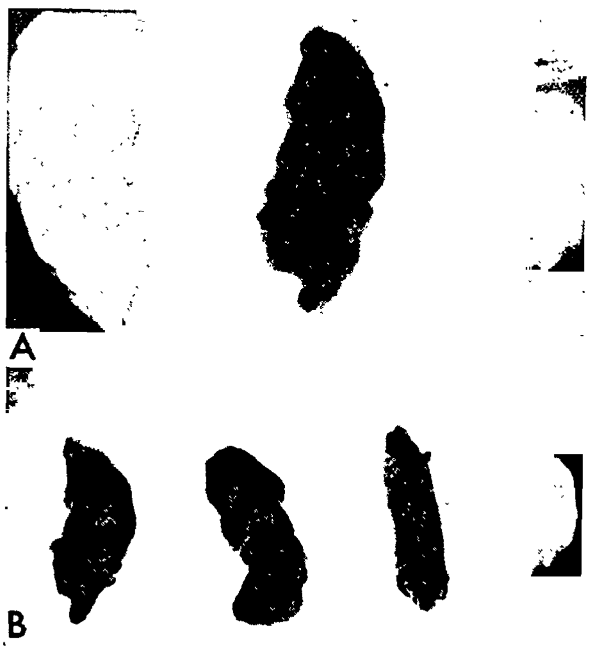


Fig. 3.—*A*, cartilage implants removed at three, six and twelve months respectively. There has been progressive shrinkage, loss of form and rigidity. *B*, cartilages removed from the abdomen and mastoid which, at the end of one year, have lost their original size, form and rigidity, to persist only as globular masses.

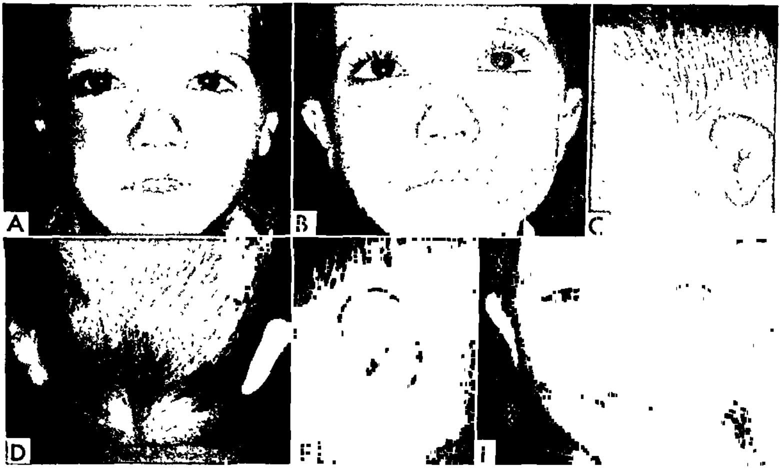


Fig. 4.—*A*, left ear at an intermediate stage of construction with knee meniscus (fibrocartilage) as a supporting framework. The ear represented in *B*, *D* and *E* is shown after three operations. Four months later, shrinking, lopping and beginning loss of proper position and detail occurred (*C* and *F*).

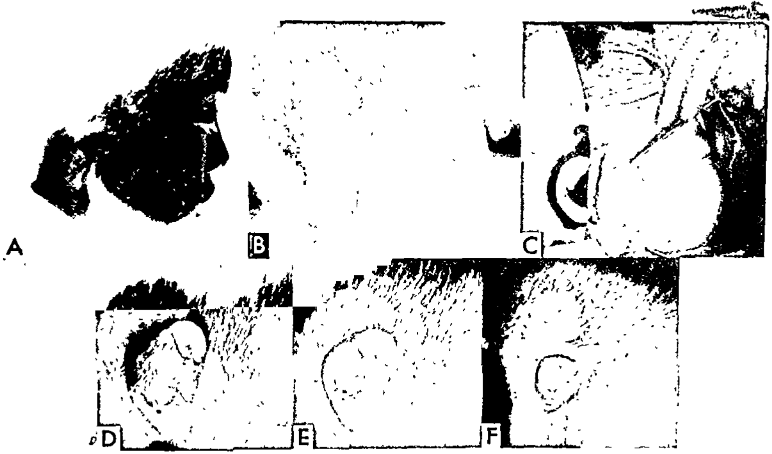


Fig. 5.—*A*, total absence of ear. *B*, hair-bearing area replaced with a full thickness skin graft. *C*, implantation of knee cartilage. *D*, constructed ear with two additional procedures for lobule and additional implant for a superior-anterior helix. *E*, hair-bearing area removed by defatting the hair-bearing skin and replacing it. *F*, appearance six months after total construction, with almost complete loss of size and total loss of form and detail.

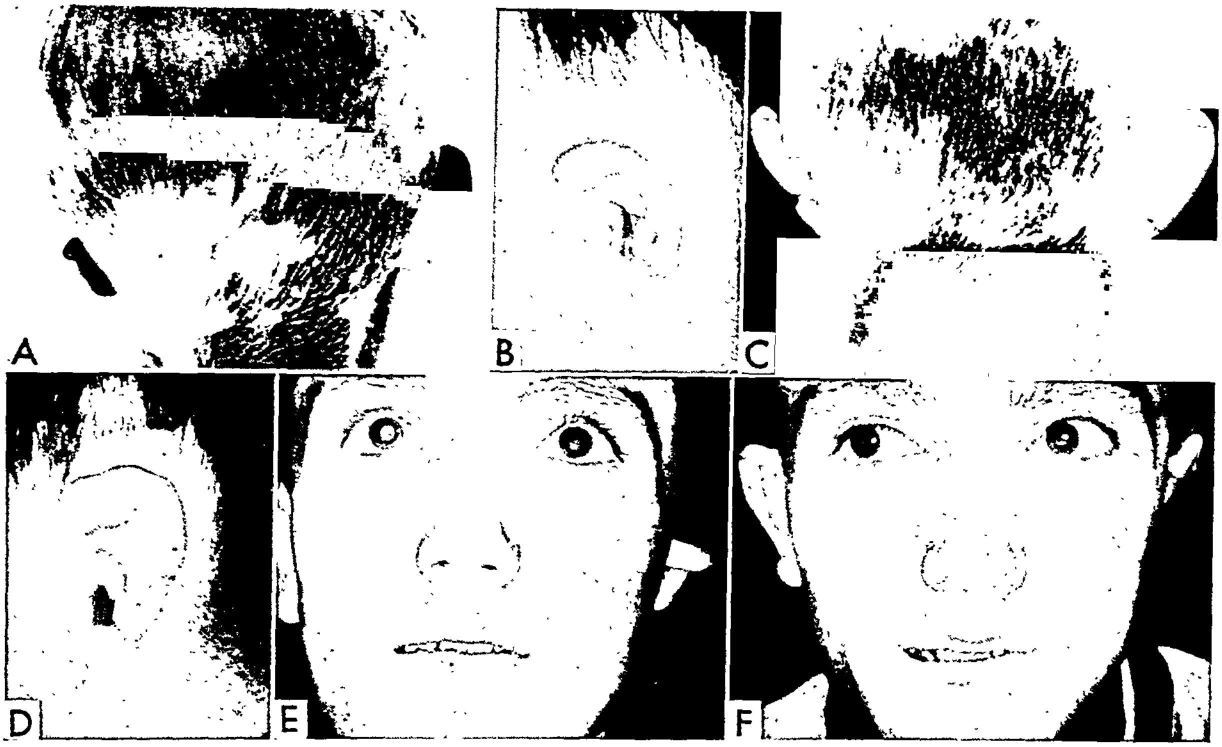


Fig. 6.—*A* and *B*, abnormally placed abortive left ear. D, an intermediate stage of construction. *C* and *F*, reconstructed ear. *E*, appearance six months after construction. There are lopping, shrinkage and loss of detail, expected to be progressive.

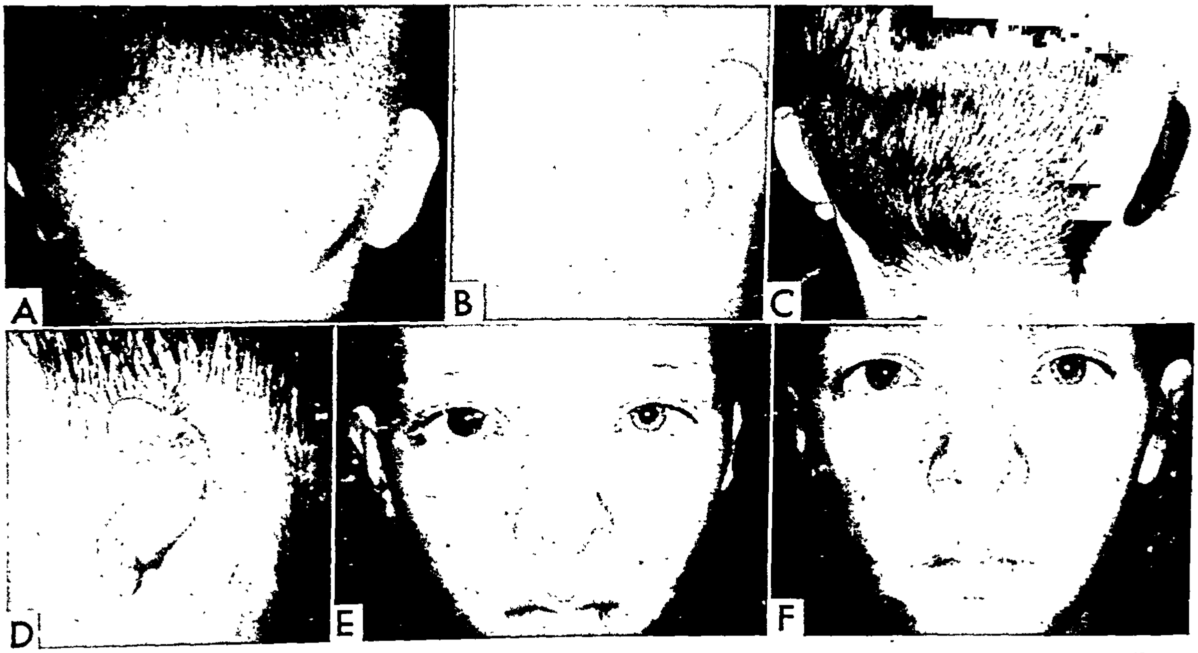


Fig. 7.—*A* and *B*, microtia, left. *D* and *E*, intermediate stages in construction with knee cartilage. Ulcer in *D* resulted from a fall. *C* and *F*, final result.

lized, and subjected to biopsy, and the cephaloauricular angle was filled with a superior and an inferior single pedicle flap. The open area on the ear and mastoid was covered with a thick split-thickness skin graft. At six months abdominal implants previously transferred to the mastoid area were mobilized and subjected to biopsy. At one year, eighteen months and two years, respectively, reconstructed ear cartilage implants were studied by biopsy, and in some cases the total implant was removed.

All surgical procedures in these 12 cases were performed without infection. The ulcer shown in Figure 7*D* resulted from a fall. In no instance was either a fresh or a preserved cartilage implant accompanied by an inflammatory reaction or the accumulation of sterile fluid.

Aqueous merthiolate solution, as described by Pierce and O'Connor and by Brown, was used as a storage medium for the menisci. The specimens were kept at ordinary refrigerator temperatures. The fluid and cartilage samples were cultured at three-week intervals, and at no time were implants used from contaminated stock solutions. Contaminated solutions were observed on 2 occasions, and the material was discarded.

All procedures were done with the patient under general endotracheal anesthesia. Buried No. 5-0 white silk and cutaneous No. 5-0 black silk sutures were used.

Gross Pathologic Observations. — The gross meniscus when obtained is irregular (Fig. 1*A*) but when trimmed appears quite suitable for ear reconstruction (Fig. 1*B*). The gross rim curvature, the pres-

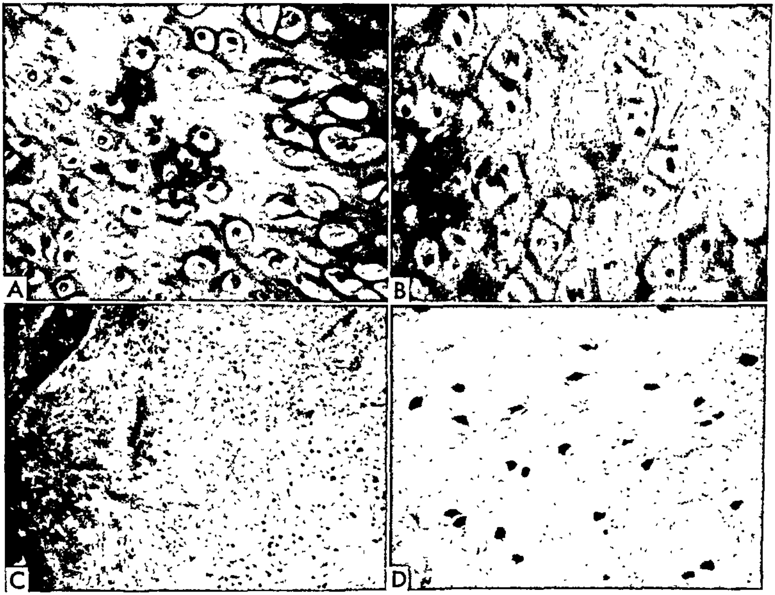


Fig. 8.—*A*, hyaline cartilage. *B*, elastic cartilage. *C* (×9½), fibrocartilage (knee meniscus) with its intercellular collagen bundles, between which are situated rounded and elongated collagen cells. *D* (×30), fibrocartilage with wavy collagen and many cells.

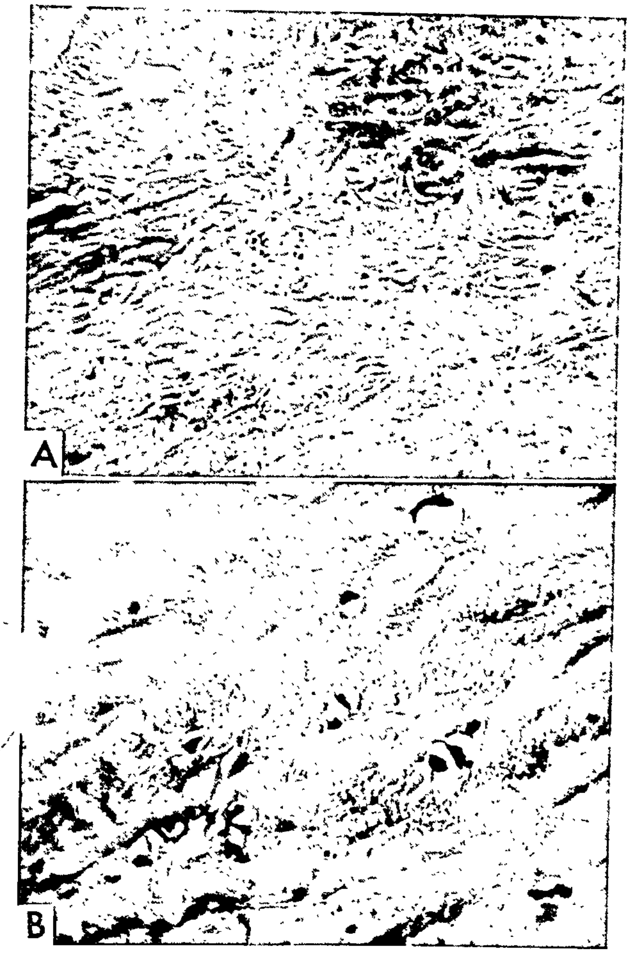


Fig. 9.—*A* (×7½), fibrocartilage after storage in 1:4,000 aqueous merthiolate for eighteen months. *B* (×30), compactness of the collagen bundles is somewhat decreased with an early fibrillary nature associated with some clefts between the collagen bundles. The lacunae appear partially empty, owing to some shrinkage of the cells.

ence of a concave surface and the gross size seem ideal, since all of these features are desired in the ear, with seemingly few alterations. A wide variety of sizes of segments with curvatures suitable to construction of ears either on the right or on the left are readily obtainable (Fig. 2*A*). Storage problems are minimal. While stored the cartilage changes little, if any (Fig. 2*B*). The configuration, size, gross texture and resiliency were unchanged after storage three, six, twelve and eighteen months. Initially the knee cartilages were buried in the abdomen, so that any tissue reaction or change in the cartilage might be observed. Later in the study the cartilages were placed directly into the mastoid area. There has been no infection and no instance of sterile fluid accumulation about the cartilages. The menisci, when removed from the abdomen or the mastoid area, were always without firm union with the adjacent tissue and were encapsulated by a moderately thick fibrous capsule. Cartilages have been left in the abdomen for three months before transfer, and in other instances longer, for observation. At the end of three months there was moderate compression and some loss of detail in form. The cartilages are still adequate for use in ear reconstruction, however, and have been used in 4 instances. In 8 cases the cartilage was placed

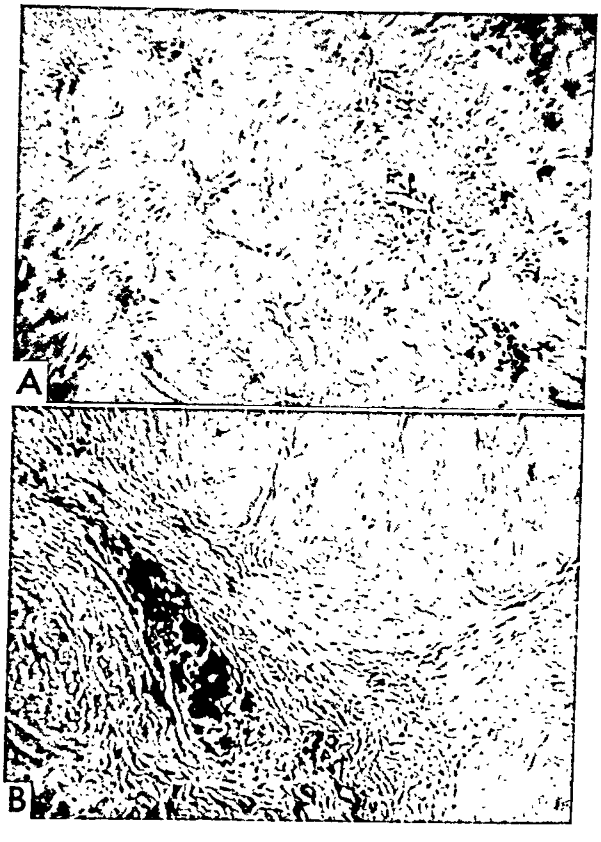


Fig. 10.—*A*, increased vascularity noted in the peripheral one-third. B, foreign body reaction to No. 5-0 white silk, around which most of the increased vascularity occurred.

directly into the mastoid area. In all instances there was progressive shrinkage, loss of form and loss of rigidity as observed at three, six and twelve months (Fig. 3*A*). When cartilages originally of equal size were removed from either the abdomen or the mastoid area at one year or over (3 were removed in two years), there remained only a small globular mass without either form or rigidity (Fig. 3*B*).

Clinical Observations. — The clinical changes were compatible with the gross pathologic alterations. The original form and somewhat rubbery consistency of the constructed ear is encouraging, especially in view of the simplicity of the procedure involved in obtaining and utilizing knee menisci. Figure 4*A* illustrates an early stage in reconstruction of the left ear. After three operations the ear is quite acceptable (Fig. 4, *B*, *D* and *E*). Four months later, however, the ear has lost its support, has lopped, and is shrinking in total size (Fig. 4, *C* and *F*). This discouraging chain of events was seen repeatedly (Fig. 5, *A* and *E*), with shrinkage, noted in some to be almost complete (Fig. 5*F*). Figure 5 represents operative sequence taken on two cases. Subtotal reconstruction affords less opportunity for shrinkage. A segment of rudimentary ear can be rotated to a superior-anterior helix position and a lobule salvaged inferiorly. This leaves a central segment to be built, it being wedged between two more nearly normal sections. Satisfactory ears are obtained by this method (Fig. 6, *C* and *F*), but within four months to one year these also lose their support, their upright relation to the head (Fig. 6*E*), and detail, and the total size decreases greatly. Quite consistently satisfactory ears can be constructed (Fig. 7, *C* and *D*), but they do not last. Shrinkage, lopping and loss of detail were consistent after four to six months.

Microscopic Observations.—For a more satisfactory evaluation of the observations in this study, cartilages were sectioned for

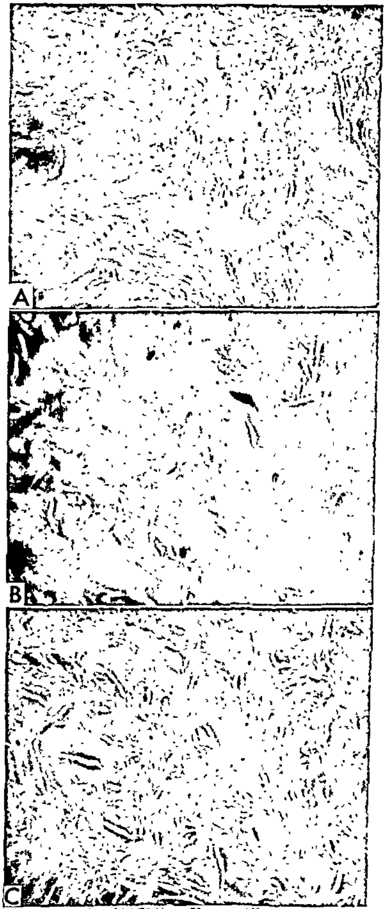


Fig. 11.—*A* (×7½), fibrocartilage recovered from mastoid area after four months. Note decrease in compact collagen bundles and collagen cells, increase in loose fibrillary character of intercellular material, multiple clefts in intercellular substance and beginning areas of hyalinization and smudging. *B*, same specimen, ×30. *C* (×7½), cartilage removed from abdomen after four months. Changes are similar to those in cartilage removed from [illegible] time (*A* and *B*).

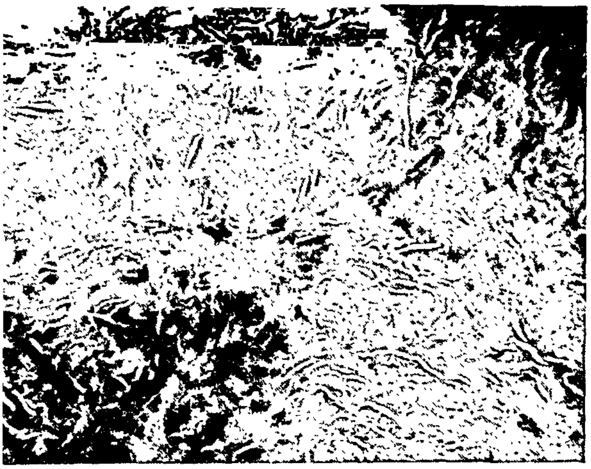


Fig. 12 (×7½).—Fibrocartilage recovered from he mastoid after six months. There is loss of the ollagen bundle structure, with numerous clefts. Note the hyalinization and smudging in the lower corner and the general absence of cartilage cells.

microscopic study. All tissues were stained with hematoxylin-eosin stains. The observations made by a pathologist who did not know the purpose or sequence of the slide tudies are presented. His data support he clinical and gross pathologic observaions.

Comparison of basic cartilage types was made in establishing the knee meniscus as a fibrocartilage of basic mesenchymal cell (connective tissue cell) origin. Hyaline cartilage from the rib, with its homogeneous matrix, elastic cartilage from the ear, with its identifying fibrillary (elastic) stroma, and fibrocartilage from the knee meniscus are illustrated (Fig. 8, *A* and *D*). High-powered and low-powered photomicrographs of sections of the fibrocartiage demonstrate the typical intercellular substance of collagen bundles, between which are situated rounded and elongated collagen cells. Contrary to Vidaurre's report, there is no pericondrium on fibrocartilage.[14] This tissue represents a transition between connective tissue and hyaline cartilage. Many plump cells fill their lacunae in sections of fresh knee cartilage. Menisci stored in aqueous merthiolate and maintained as sterile specimens in an ordinary refrigerator present no gross and few microscopic changes. There occurred, however, some shrinking of the previously plump cells, leaving the lacunae partially empty (Fig. 9*A*). Also, there was some decrease in the compactness of the collagen bundles, and a few clefts developed between some of these bundles (Fig. 9*B*). The changes were identical when these cartilages were placed in the abdominal wall and transferred to the mastoid area, left in the abdominal wall, or placed in the mastoid area originally and left there for equal periods. In sections made after implantation for one to two months, increased vascularity can be noted, especially in the peripheral one-third of the specimen (Fig. 10*A*). This would seem to indicate increased viability, even though one sees no intimate relation grossly between the host and the implant to suggest this. Much of this vascular change remains peripherally located and in many instances is intimately related to areas of foreign body reaction to silk (Fig. 10*B*). At this point, two months after implantation, the clinical observations, seemingly insignificant gross cartilaginous changes, and a possible indication of host acceptance (reflected in improved circulation) all stimulated encouragement soon to be thwarted. Between two and four months the collagen bundles lost detail, became distinctly fibrillary (Fig. 11, *A* and *B*) and were separated by numerous clefts (Fig. 11, *A* and *C*). The cartilage cells were fewer, and many lacunae were empty (Fig. 11, *A*, *B* and *C*). The increased vascularity became less evident, and many areas of collagen degeneration and wide areas of smudging appeared (Fig. 11*A*). Sections made of cartilage removed from the mastoid and completed ears (Fig. 11, *A* and *B*) are similar to those of cartilage removed from the abdomen after an equal time of implantation (Fig. 11*C*). Six months after implantation these changes were even more marked, and by then or within one or two additional months the microscopic picture paralleled the gross pathologic shrinkage, loss of detail and form and the clinical failures. Microscopically one noted a fibrillary tendency in the formerly compact collagen bundles, and there were numerous clefts in the intercellular structure. Cartilage cells were absent or only rarely seen, and the lacunae were empty. Large areas of smudging were noted, and the tissue persisted only as a hyalinized, nonvascular mass surrounded by a fibrous capsule. (Fig. 12).

SUMMARY AND CONCLUSIONS

In the total or subtotal construction of ears homogenous knee menisci, as a framework, have given initial results. Mir y Mir is enthusiastic about these fibrocartilages, as was I early in this study. Mir y Mir's work is substantiated in that the cartilage cells die. His observations — persistent gross size, clinical elasticity and resiliency and lack of microscopic evidence of degeneration of the collagen bundles — are not substantiated by this study. Fibrocartilage (connective tissue of primitive mesenchymal origin) is not invaded by fibroblasts but is encapsulated. Possibly there is some conversion to the primitive connective tissue cell. Observations during this study would indicate degeneration and hyalinization of the collagen bundles, with total loss of form and size.

It is possible that autogenous knee cartilages would be more serviceable in many respects than are homogenous menisci. It is hoped that a study of this possibility can be reported on in the future. One would hesitate, however, to risk injury to a normal knee in this search for a better material for reconstruction of the ear.

In conclusion, it can be stated that the early enthusiasm for homogenous menisci (fibrocartilage) for total and subtotal ear reconstruction is not supported by further observation. True, the cartilages are readily available and are easily and safely stored, and there is little change in them after storage for one year. After their implantation into the abdominal wall or mastoid area, however, there is loss of gross form and size. Microscopically there is loss of the cartilage cells, and fibrillary disruption of the collagen bundle occurs, with consequent smudging and hyalinization. These changes are clinically evinced by shrinking, lopping and loss of form in reconstructed ears that initially were satisfactory. Degenerative changes are evident about two months after implantation and are complete in six to nine months.

ZUSAMMENFASSUNG

Der arteigene Meniskus des Kniegelenks ergibt als Gerüst beim völligen oder teilweisen Wiederaufbau der Ohrmuschel anfängliche Erfolge. Im frühen Stadium meiner Untersuchungen habe ich die Begeisterung von Mir y Mir über diese Faserknorpel geteilt. Ich kann die Arbeit von Mir y Mir insofern bestätigen, als die Knorpelzellen zugrunde gehen. Seine Beobachtungen jedoch, dass die kollagenen Bündel ihre Grösse, Elastizität und Federung beibehalten und mikroskopisch keine Degeneratioserscheinungen aufweisen, werden durch meine Untersuchung nicht gestützt. Faserknorpel (Bindegewebe, das vom primitiven Mesenchym abstammt) wird nicht von Fibroblasten durchdrungen, sondern wird eingekapselt. Möglicherweise kommt es zu einer Umwandlung zur primitiven Bindegewebszelle. Die Beobachtungen während meiner Untersuchung weisen auf eine Degeneration und Hyalinisierung der kollagenen Bündel mit völligem Verlust ihrer Gestalt und Grösse hin.

Es ist möglich, dass der autogene Knorpel des Kniegelenksmeniskus in vieler Hin-

sicht geeigneter ist als der homogene Knorpel, und es besteht die Hoffnung, dass darüber später berichtet werden kann. Es ist jedoch schwierig, die Schädigung eines gesunden Knies zu riskieren, um ein geeigneteres Material zur Wiederherstellung des Ohres zu finden.

Zusammenfassend lässt sich sagen, dass die erste Begeisterung für den homogenen Meniskus (Faserknorpel) zur völligen oder teilweisen Wiederherstellung des Ohres sich durch weiter Beobachtungen nicht rechtfertigen lässt. Es stimmt, dass diese Knorpel leicht erhältlich und konservierbar sind und nach einjähriger Aufbewahrung kaum irgendwelche Veränderungen aufweisen. Nach ihrer Einpflanzung in die Bauchwand oder in die Gegend des Proc. mastoideus jedoch büssen sie an Grösse und Form ein. Mikroskopisch erkennt man den Verlust von Knorpelzellen und fibrilläre Unterbrechung der kollagenen Bündel mit anschliessender Auflösung und Hyalinisierung. Klinisch äussern sich diese Veränderungen als Schrumpfung, Zusammenfall und Formverlust des operierten Ohres, das im Anfang zufriedenstellend aussah. Die degenerativen Zustände treten etwa zwei Monate nach der Implantation ein und erreichen ihren Höhepunkt innerhalb von sechs bis neun Monaten.

RIASSUNTO

Per la ricostruzione delle orecchie è stato impiegato un trapianto omologo di menisco prelevato dal ginocchio, e l'Autore, assieme a MIR y MIR, se ne è dimostrato, all'inizio, entusiasta. Secondo MIR de cellule cartilaginee morirebbero, ma lo studio condotto dall'autore ha potuto dimostrare alterazioni cellulari e degenerazione dei fasci collageni. La fibrocartilagine (tessuto di origine mesenchimale) non è invasa dai fibroblasti ma viene incapsulata e forse vi è una trasformazione verso cellule di tipo connettivale. Altre osservazioni hanno dimostrato degenerazione e ialinizzazione dei fasci collageni con scomparsa totale della forma e delle dimensioni primitive.

Forse trapianti cartilaginei autologhi potrebbero ssere più opportuni di quelli omologhi, e ci si augura che in futuro si facciano dei tentativi in questo senso, senza però trascurare il rischio di ledere un ginocchio sano nel tentativo di riparare un orecchio.

In conclusione si deve dire che i primitivi entusiasmi non sono stati confermati dalle successive esperienze. E' vero che le cartilagini sono facili da procurare e da conservare e che non si modificano anche dopo un anno di conservazione, ma dopo il loro trapianto nella parete addominale o nella regione mastoidea esse perdono il loro aspetto e le loro dimensioni, le cellule cartilaginee scompaiono, i fasci collageni si frammentano con successiva ialinizzazione. Queste modificazioni si traducono clinicamente in una perdita di forma dell'orecchio ricostruito, dopo un periodo iniziale in cui il risultato sembrava soddisfacente. Le alterazioni sono già evidenti dopo un mese dal trapianto e si completano dopo 6-9 mesi.

RÉSUMÉ

Dans la réconstruction totale ou presque totale des oreilles l'usage des ménisques du genou homogènes pour support a donné des résultats favorables initialément. Mir y Mir sont enthousiastiques de ces fibrocartilages, comme j'étais moi meme au commencement de mes essays. L'Oeuvre de Mir y Mir est basé sur le principe que les cellules du cartilage meurent. Leur observations de persistence du greffon en grandeur et élasticité et de l'absence d'éviden ce microscopique de dégénération des fibres collagéneuses ne sont pas confirmées par ces études. Fibrocartilage (tissu fibrocellul aire d'origine primitive mesenchymal) n'est pas pénétré par les fibroblastes mais il est encapsulé. Il y a peut-etre une

espèce de conversion en cellules connectives primitives. L'observation pendant cette étude indique plutôt une dégénération et hyalinisation des fibres collagéneuses avec perte totale de forme et volume. Il est possible que le cartilage autogène du genou donnerait souvent de meilleurs résultats que les menisques homogènes. On espère, qu'une étude de cette possibilité peut être reportée au futur. Tout de même on hesiterait de risquer une lésion d'un genou normal en cherchant un meilleur matériel pour la réconstruction d'une oreille.

En résumant il faut constater, que l'enthousiasme précoce pour les méniques homogènes (fibrocartilage) pour la réconstruction totale ou presque totale des oreilles n'est pas confirmé par les observations continues. C'est vrai, que les cartilages peuvent être obtenus facilement et conservés surement et qu'ils changent peu après avoir été conservés pendant une année. Mais après leur implantation dans le paroi abdominale ou la région mastoide ils perdent leur forme et volume. Microscopiquement les cellules cartilagineuses périssent, les fibres et les faisseaux fibrillaires déchirent, suivi par souillure et hyalinisation. Cliniquement des oreilles reconstruites, qui d'abord paraissaient satisfaisantes, *retréfissent* perdent en volume forme et consistence. Les changements dégénératifs sont évidents a peu près deux mois après l'implantation et sont complets apres six a neuf mois.

RESUMEN

En la construcción total o subtotal de las orejas el menisco homogéneo de la rodilla ha proporcionado sus resultados iniciales. Al empezar este estudio me encontraba entusiasta al igual que Mir y Mir, quienes demostraron en su trabajo la muerte de las células cartilaginosas del disco. En nuestro estudio no se comprobaron las observaciones de la conservación del tamaño elasticidad clínica y falta de evidencia microscópica de degeneración de los haces colágenos. El fibrocartílago (tejido conjuntivo de origen mesenquimatoso) no es invadido por los fibroblastos pero es encapsulado. Posiblemente se presenta alguna conversión a la célula primitiva conjuntiva. La observación de estudio podría indicar la degeneración y la hialinización de los haces colágenos, con la perdida total de la forma.

Es posible que los cartílagos autógenos podrían ser muy útiles. Se tiene la esperanza de que el estudio de esta posibilidad pueda ser comunicada en el futuro. Sin embargo, se duda acerca del riesgo de la producción de una lesión en una rodilla normal en la búsqueda por un material mejor para ser usado en la reconstrucción de la oreja.

En conclusión se puede decir que el entusiamso precoz por los meniscos homogéneos (fibrocartílagos) para la reconstrucción parcial o total de las orejas no apoyado por las últimas observaciónes. Verdaderamente los cartílagos pueden obtenerse facilmente y no ocurren cambios en ellos al ser almacenados hasta por un año. Sin embargo, cuando se trasplantan a la pared abdominal, o al área mastoidea, pierden su apariencia y forma. Microscópicamente se demuestra una pérdida de células cartilaginosas y se produce una perturbación de los haces de colágeno con la hialinización consiguiente. Estos cambios se demuestran clínicamente por un acortamiento y perdida de la forma en las orejas reconstruídas que al principio aparecían satisfactorias. Los cambios degenerativos son evidentes a los dos meses después de la implantación y son completos en un plazo de seis a nueve meses.

REFERENCES

1. (a) Kirkham, H. L. D.: Use of Preserved Cartilage in Ear Reconstruction, Ann. Surg. 111:896, 1940. (b) Gilles, H. D.: Reconstruction of the

External Ear with Special Reference to the Use of Maternal Ear Cartilage as the Supporting Structure, Rev. de Chir. Streuct. 16:169, 1937. (c) Peer, L. A.: Cartilage Grafting, Surg. Clin. North American 24:404, 1944. Reconstruction of the Auricle with Diced Cartilage Grafts in a Vitallium Mold, Plast. and Reconst. Surg. 3:653, 1948. (d) Aufricht, G.: Total Ear Reconstruction: A Preliminary Report, Plast. & Reconst. Surg. 2: 297, 1947. (e) Greely, P. W.: Reconstructive Otoplasty: Further Observations; Utilization of Tantalum Wire Mesh Support, Arch. Surg. 53:24, 1946. (f) Pearce, G. W.; Klabunde, E. H., and Probst, H. T.: Further Observations on Reconstruction of the External Ear, Plast. & Reconst. Surg. 10:395, 1952. (g) Steffensen, W. H.: Comments on Total Reconstruction of the Ear, Plast. & Reconst. Surg. 10:186, 1952. (h) Brown, J. B., and others: Surgical Substitutions for Losses of the External Ear: Simplified Local Flap Method of Reconstruction, Surg. Gynec. & Obst. 94:192, 1947. (i) Brown, A. M.: Congenital Bilateral Ear Atresia: Correction with Plastic Surgery and Prosthesis, Plast. & Reconst. Surg. 7:327, 1951. (j) Converse, J. M.: Reconstruction of the External Ear by Prefabricated Framework of Refrigerated Bone and Cartilage, Plast. & Reconst. Surg. 5:148, 1950.

2. Mir y Mir, L.: The Role of the Meniscus of the Knee in Plastic Surgery, Plast. & Reconst. Surg. 10:431, 1952.

3. Sarnat, B. G., and Laskin, D. M.: Cartilage and Cartilage Implants, Surg., Gynec. & Obst. 99: 521, 1954.

4. Hewer, E. E.: Textbook of Histology. St. Louis: The C. V. Mosby Company, 1938.

5. Vidaurre, S.: Saddle Noses, Plast. & Reconst. Surg. 10:35, 1952.

6. Peer, L. A.: Behavior of Autogenous Human Tissue Grafts, Plast. & Reconst. Surg. 7:73, 1951.

One of the most powerful sources of false belief is envy. In any small town you will find, if you question the comparatively well-to-do, that they all exaggerate their neighbors' incomes, which gives them an opportunity to justify an accusation of meanness. The jealousies of women are proverbial among men, but in any large office you will find exactly the same kind of jealousy among male officials. When one of them secures promotion the others will say: "Humph! So-and-so knows how to make up to the big men. I could have risen quite as fast as he has if I had chosen to debase myself by using the sycophantic arts of which he is not ashamed. No doubt his work has a flashy brilliance, but it lacks solidity, and sooner or later the authorities will find out their mistake." So all the mediocre men will say if a really able man is allowed to rise as fast as his abilities deserve, and that is why there is a tendency to adopt the rule of seniority, which, since it has nothing to do with merit, does not give rise to the same envious discontent.

—*Russell*

Proctologic Surgery

Amputation Neuroma of the Anus

Report of a Case

MARK M. MARKS, M.D., F.I.C.S.
KANSAS CITY, MISSOURI

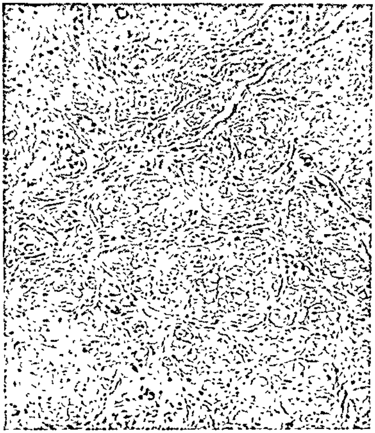
AMPUTATION neuromas have been described as occurring in a variety of organs that have undergone surgical treatment. Some difference of opinion exists as to whether these benign proliferations of nerve and supporting tissue are true tumors. Recent tests classify these lesions with tumors of nerve and of the neurodermal supporting structure of nerves.[1] The extremities[2] are the most common sites for such growths, but they have also been found in the oral cavity and mentioned as a cause of obstruction in the bile duct following gallbladder operations.[3] *Josephsson claims that these benign tumors may occur in any nerve where continuity has been partially or totally interrupted.* Chauvel[4] found them in 81 per cent of all amputation stumps over 50 years old.

Considering the number of patients who have undergone anorectal operations, it is surprising that amputation neuromas have not been reported as occurring in this highly sensitive area. Because of their apparent rarity, the following case is presented.

REPORT OF CASE

Mr. H. P., aged 58, was examined because of pain on defecation. This symptom had been slowly increasing in severity since a rectal operation seven years prior to examination. There were no other complaints referable to his digestive tract.

The anal outlet was well healed, with minimal scarring, and was adequate in size. There was some reformation of anal varices, but these were not symptomatic. On the right lateral posterior quadrant of the mucocutaneous juncture a nodule the size of a match head was observed. When this was ma[illegible]ulated it produced the [illegible] discom[illegible]



Section of specimen.

Submitted for publication Aug. 17, 1955.

cording to the patient. Low spinal anesthesia was induced, and this nodule, the anal varices and several enlarged crypts were removed. Postoperative healing was uninterrupted, and there was no return of the pain after a full year.

Microscopic examination of the nodule (see illustration) was reported as follows:

"A section of the specimen submitted as a granuloma shows it to be covered on its external surface by a continuous layer of stratified squamous epithelium, in which no unusual changes are noted. A large portion of the stroma of the specimen, extending to the deep line of resection, is occupied by a well-defined unencapsulated nodule composed largely of bundles of fibrillous tissue having the appearance of nerve fibers, the majority of which are present in the form of well-defined small bundles separated by thin fibrous connective tissue bands. The majority of the nerve fibers in the section appear in cross section. Throughout the nodule are a number of blood vessels of small caliber, frequently in intimate relation to the nerve fibers. A fair number of dilated, congested, thin-walled, small and medium-caliber blood vessels lie in the stromal tissue between the covering squamous epithelium and the superficial aspect of the nodule. Diagnosis: Neuroma (amputation type) of anal tissue."

SUMMARY

A benign tumor of the anus is described as an amputation neuroma following anorectal surgery.

ZUSAMMENFASSUNG

Es wird eine gutartige Geschwulst des Afters beschrieben, die sich als ein nach einer anorektalen Operation entstandenes Amputationsneurom herausstellte.

RIASSUNTO

Viene descritto un neuroma benigno dell'ano consecutivo ad intervento anorettale e considerato come neuroma da amputazione.

RÉSUMÉ

Un tumeur bénigne est décrit comme neurome d'amputation suivant une opération ano-rectale.

RESUMEN

Se describe un tumor benigno del ano como un neuroma consecutivo a una operación anorectal.

REFERENCES

1. Anderson, W. A. D.: Pathology. St. Louis: The C. V. Mosby Company, 1953. 2d ed., p. 1306.

2. (a) Livingston, K. E.: The Phantom Limb Syndrome: A Discussion of the Role of Major Peripheral Nerve Neuromas, J. Neurosurg. 2:25, 1945. (b) Josephsson, H.: Amputation Neuromas of Finger Nerves. Acta chir. Scand. 81:460, 1939.

3. Bartlett, M. K., and McDermott, W. V.: Amputation Neuroma of Bile Ducts with Obstructive Jaundice, New England J. Med. 251:213-216, 1940. Hume, R. H., and Buxton, R. W.: Postcholecystectomy Amputation Neuroma, Am. Surgeon 20:698-708, 1954.

4. Chauvel: Cited by Josephsson.[2b]

* * *

That man is never happy for the present, is so true that all his relief from unhappiness is forgetting himself for a little while. . . Happiness is not found in self-contemplation, it is perceived only when it is reflected from another.

—*Johnson*

Pedunculated Fibroma and Leiomyoma of the Lung

NIHAD DORKEN, M.D., F.I.C.S.

ISTANBUL, TURKEY

WITH the exception of chondroma, which is common enough, fibroma and leiomyoma of the lung are extremely rare benign tumors. Yet Graham and Vormack have expressed the opinion that benign tumors of the lung must always be considered potentially malignant. One of Lyssenkin's cases, in which a fibroma of the lung developed into a malignant xanthomatous fibrosarcoma, supports their theory.

The clinical signs of benign tumor of the lung are not particularly startling. The growth arouses attention only after it has attained great dimensions, giving rise to pain, disturbances of the pulmonary circulation, dyspnea or osteoarthropathic change. The tumor may also impede the drainage of the bronchi, provoking pulmonary disturbances or secondary bronchiectasis. Thoracic pain, mediastinal compression and deviation of the esophagus are all late signs, indicating that the tumor has grown extensively. Small tumors are discovered only at autopsy or through a chance roentgenogram. In fact, the tumor in my own first case was discovered in the

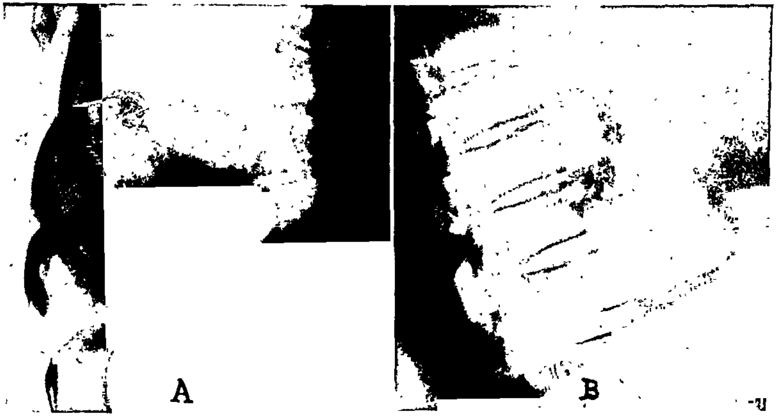


Fig. 1 *(Case 1)*.—Roentgenograms of patient with pedunculated fibroma of the lung. *A*, roentgenogram showing homogenous opaque area at the base of the right lung. *B*, lateral view showing this mass with its outline almost complete.

Submitted for publication Jan. 3, 1955.

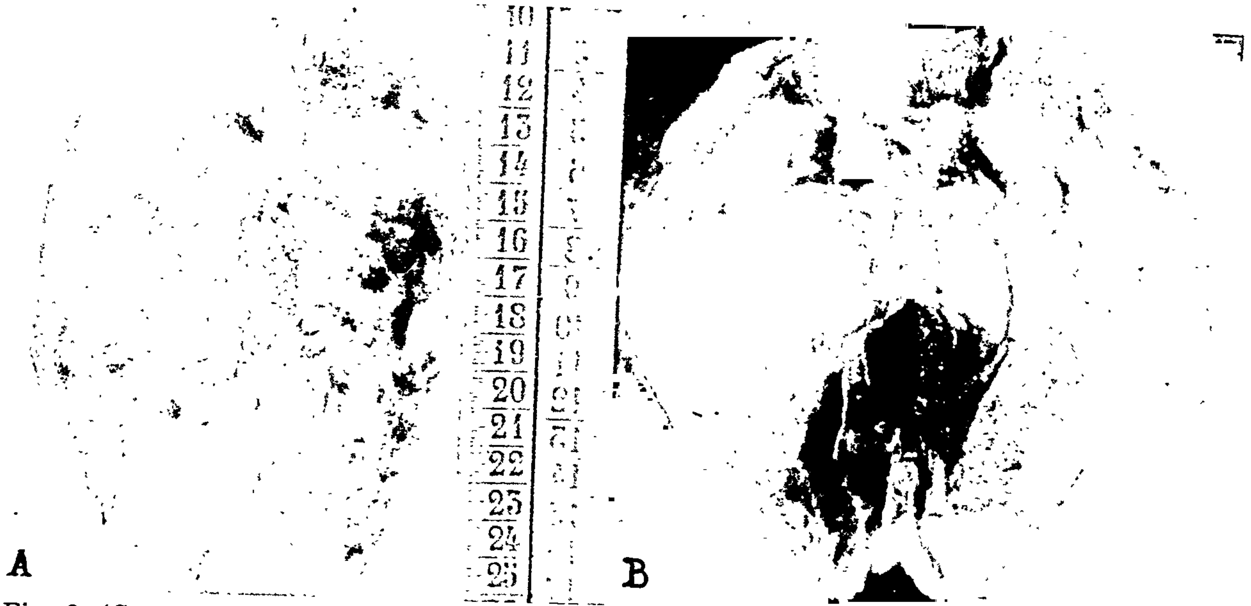


Fig. 2 *(Case 1)*.—*A*, resected specimen, including paracardiac segment. *B*, photograph showing resemblance of specimen to a pulmonary lobe.

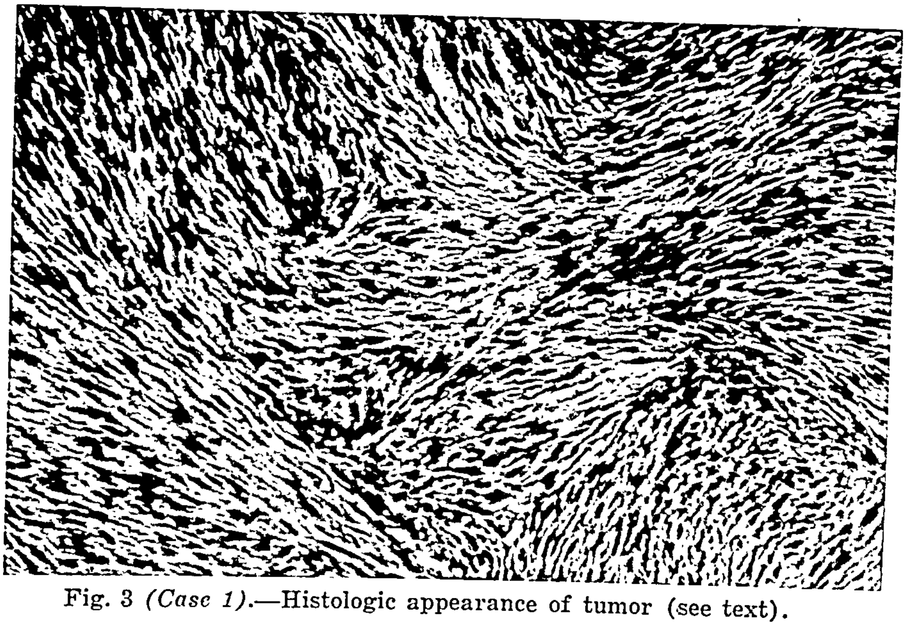


Fig. 3 *(Case 1)*.—Histologic appearance of tumor (see text).

latter. It is usually impossible to diagnose the growth with any exactitude before operation is performed.

CASE 1 *(Pedunculated Fibroma of the Lung)*.—A. S., a fisherman aged 60, was admitted to the clinic on March 11, 1953. He presented no pulmonary abnormalities, but he complained of epigastric pain, associated with vomiting, of thirty years' duration. He proved to have a duodenal ulcer. Some days prior to his hospitalization a routine radioscopic study made before the passage of a gastric tube revealed a round opaque area at the base of the right lung. (Fig. 1*A*). The personal and family history revealed no abnormality. The patient was well nourished and in good general condition, both physically and mentally. Turgor was normal.

Clinical examination revealed tenderness in the epigastric region. No other abnormality was encountered.

The thorax was symmetric. The respiratory movements were equal on the two sides.

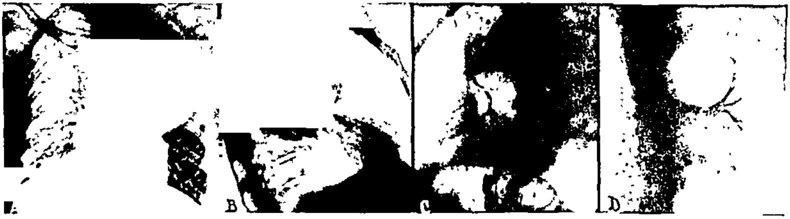


Fig. 4 *(Case 2)*.—*A*, and *B*, roentgenograms showing large mass entirely filling the upper part of the left lung. *C*, film showing displacement of trachea and esophagus by tumor. *D*, upper left bronchus flattened by tumor.

Slight dullness in an area as large as the palm of a hand was observed at the right middle axillary line between the fifth and sixth intercostal spaces. Thoracic vibration was diminished on the right. The vesicular murmur at the base of the right lung was reduced.

The red blood count was 3,500,000 per cubic millimeter, with 60 per cent hemoglobin. The white blood cells numbered 6,250 per cubic millimeter, with a differential count of 66 per cent neutrophils, 29 per cent lymphocytes, 1 per cent monophils and 4 per cent eosinophils. The sedimentation rate in the first hour was 33 mm. in the second hour 66 mm. The blood was of the B group, Rh negative. The urine was normal. The Casoni and Weinberg reactions were negative. The vital capacity was 4,000 cc.

Roentgen study revealed a duodenal ulcer. A thoracic film showed a homogenous opaque area the size of a large orange at the base of the right lung. It was regularly outlined, and mobile during respiration. As in cases of hydatid cyst, ellipsoid movements appeared with each respiration during the radioscopic study, giving the impression, indeed, that a hydatid cyst was present. A lateral roentgenogram (Fig. 1*B*) showed this mass with its outline almost complete.

Clinical and roentgen signs led to the diagnosis of hydatid cyst. In Turkey this entity occurs frequently, and the Casoni and Weinberg reactions are often negative even when the diagnosis has been otherwise confirmed.

On March 18, with the patient under intubation narcosis and after resection of the right eighth rib through a posterolateral incision, I opened the pleural cavity. No pulmonary adhesions were observed. Widening the cavity with a retractor disclosed an orange-sized mass covered with parietal pleura, moving simultaneously with respiration and attached to the paracardiac segment by a pedicle 4 cm. long. The consistency of the mass was that of fibroma. The pedicle made it possible to remove the tumor through the incision. It was then resected, together with the paracardiac segment (Fig. 2*A*). The lung being otherwise normal, the thoracic wall was closed without drainage.

The pedicle between the tumor and the paracardiac segment was richly vascularized. The tumor itself measured 7 by 12 by 7 cm. It had some resemblance to a pulmonary lobe, showing an even surface with hemorrhages here and there (Fig. 2*B*). There was also two anthracotic points on the surface. The mass

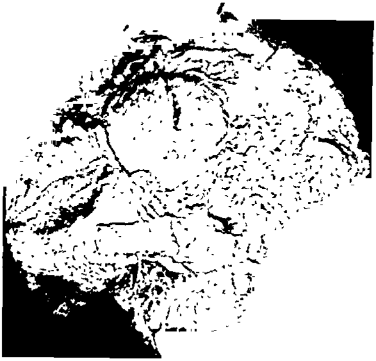


Fig. 5 *(Case 2)*.—Tumor excised at autopsy.

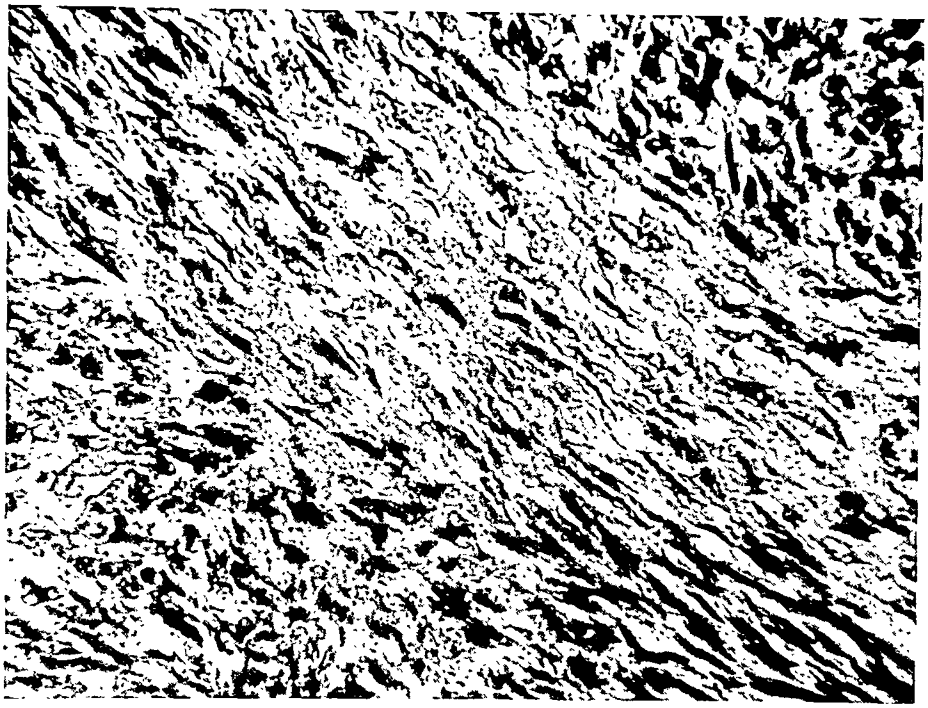


Fig. 6 (*Case 2*).—Histologic appearance of tumor (see text).

was hard and appeared fibrous, and it was surrounded by a soft reddish mass presenting many lentil-sized hard whitish foci. The reddish mass was without definite outline.

Examination of many histologic slides failed to show anything resembling a bronchus, a bronchiolus or an alveola. Anthracotic areas were likewise absent. The mass was composed of collagenous fibers and paratypical conjunctival tissue rich in nuclei (Fig. 3). Large hemorrhages were visible here and there, as well as loose conjunctival tissue infiltrated with erythrocytes. Some parts consisted of bundles of hyaline conjunctival tissue. In the necrotized parts, thrombosed vessels were present. In slides stained with Van Giesen's dye all the fibrotic tissue appeared red. The histologic diagnosis was pulmonary fibroma, large, partly necrotized and partly cicatrized, with a subpleural pedicle.

CASE 2 (*Giant Leiomyoma of the Lung*).—H. A., a man aged 31, came to the hospital on Nov. 3, 1953, complaining of pain in the left side of the back, pain on coughing, dyspnea, and emaciation. The disease had begun two months earlier, with violent pain in the left scapular region. The pain was occasionally accompanied by coughing, with expectoration of odorless and bloodless sputum. The temperature never rose above normal. Later the dyspnea was accompanied by dysphagia. No relevent data were obtainable from the personal and family history of the patient.

The patient was psychically normal. The bone formation, the subconjunctival adipose tissue and the tonus were normal. Clinical examination revealed the left hemithorax more definitely arched than the right. Its wall showed venous proliferation without venous engorgement over the neck. On percussion, dullness was elicited, extending downward 2 fingerbreadths beneath the mammillary line. The ventricular murmur was attenuated in the same region. The right hemithorax and the other organs were normal.

Roentgen examination (Fig. 4, *A* and *B*) revealed a large homogenous mass with a regular outline entirely filling the upper part of the left lung. The esophagus and trachea were displaced and narrowed (Fig. 4*C*). A tomogram showed that the mass was visible on every layer, passed the mediastinum to the right and projected over the base of the heart. The tumor showed no excavation.

Bronchoscopic study revealed no bronchial lesion, but it could be seen that the upper left bronchus was completely flattened by the tumor (Fig. 4*D*).

The erythrocyte count was 3,900,000 per cubic millimeter of blood, with 85 per cent hemoglobin; the leukocyte count was 4800 per cubic millimeter, with a differential count of 43 per cent neutrophils, 3 per cent stab cells, 10 per cent lymphocytes and 2 per cent nonocytes. The icteric index was 1.1. The sedimentation rate at the end of the first hour was 7 mm.; at the end of the second hour, 23 mm. Casoni's reaction was positive; the Wassermann and Kahn reactions, negative. The *vital capacity* was 2,300 cc. *Koch's bacillus* was not present in the sputum.

A diagnosis of giant hydatid cyst at the apex of the left lung was made, and operation was performed on December 4. After making a Crawford incision, I dissected the skin and the muscles, resected the fifth rib posterolaterally and cut the posterior part of the fourth rib, thus arriving at the pleura. The last-mentioned tissue presented complete symphysis, and there was great difficulty in placing the automatic retractor. Exploration of the lung revealed a tumor the size of an adult head, covering the apex and the lingula and infiltrating the tissues as far as the mediastinum. Parietal adhesions were dissected with difficulty, but is was impossible *to liberate the parts adjacent to the mediastinum*, because of their adhesions to mediastinal elements. The tumor could not be separated from the arcus aortae and the other surrounding structures, and it was therefore considered inoperable. The surgical diagnosis was pulmonary sarcoma. The operation was concluded after resection of a large segment of the tumor for biopsy.

Histologic examination revealed the mass to be a leiomyoma. Nevertheless, because of its infiltration of surrounding tissues, it was my opinion that malignancy existed, even though evidence of it was not visible on the histologic slides.

The patient died forty-five minutes after the operation from tracheal compression. Figure 5 shows the tumor excised at autopsy. It was observed to have originated in the upper lobe of the left lung and to have adhered firmly to the neurovascular elements of the mediastinum, to the trachea and to the esophagus. None of the histologic slides revealed evidence of malignancy; the tumor, therefore, must be recorded as a typical leiomyoma (Fig. 6).

SUMMARY

Primary fibroma and leiomyoma of the lung are exceedingly rare benign tumors. Up to 1950 the literature contained only 5 cases of pulmonary leiomyoma. In all but Pilot's case the diagnosis was confirmed at necropsy. In spite of the benign structure of these tumors, infiltration of surrounding organs is characteristic of leiomyoma. Adhesions sometimes prevent their removal, as in the case reported in this article (Case 2).

In no case of pulmonary fibroma recorded in the literature was there a tumor with a pedicle as long as that observed in the author's case (Case 1).

ZUSAMMENFASSUNG

Primäre Fibrome und Leiomyome der Lunge gehören zu den ausserordentlich seltenen gutartigen Geschwülsten. Bis zum Jahre 1950 weist das Schrifttum nur fünf Fälle von Leiomyom der Lunge auf. Mit Ausnahme eines Falles von Pilot wurde die Diagnose jedesmal durch die Nekropsie sichergestellt. Es ist charakteristisch für das Leiomyom, dass es trotz seiner benignen Struktur in die umgebenden Organe eindringt. Verwachsungen verhindern manchmal ihre Resektion, was auch bei dem in dieser Arbeit beschriebenen Kranken der Fall war.

In keinem der in der Literatur aufgefundenen Fälle wird über einen so langen Stiel der Geschwulst berichtet wie im vorliegenden Fall beobachtet wurde.

RÉSUMÉ

Le fibrome primaire et le leiomyome du poumon sont des tumeurs extrèmement rares et bénignes. Jusqu'en 1950 il y avait seulement 5 cas de leiomyome des poumons dans la littérature. A l'exception du cas de Pilet la diagnose de touts les cas fut confirmée par l'autopsie. Malgré sa structure bénigne l'invasion des organes voisines est characteristique pour le leiomyome. Quelque fois des adhésions empèchent leur excision, comme c'était dans le cas de notre malade.

Pas un seul cas des fibromes pulmonaires dans la litterature présenta un pédicule aussi long que celui de notre malade.

RIASSUNTO

Il fibromioma e il leiomioma primitivi del polmone sono tumori benigni di assai rara constatazione. Fino al 1950 nella letteratura vi erano solo 5 casi di leiomioma del polmone, a diagnosi confermata dall'autopsia (tranne quello di Pilot). Questo tumore, per quanto abbia struttura benigna, è caratterizzato dall'infiltrazione dei tessuti circostanti. Le aderenze che così si formano possono, come nel caso presentato dall'autore, ostacolare l'asportazione chirurgica.

SUMÁRIO

O fibroma e o leiomioma primarios do pulmão pertencem ao grupo dos tumores benignos extremamente raros. Até 1950 a literatura registrava apenas 5 casos de leiomioma do pulmão. Em todos eles, com exceção do caso de Pilot, o diagnostico foi confirmado pela autopsia. A despeito da extrutura benigna destes tumores, a infiltração nos orgaões adjacentes é caracteristica do leiomioma. As aderencias impedem algumas vezes a sua extirpação, como aconteceu no caso do paciente apresentado pelo Autor.

BIBLIOGRAPHY

Adams, R.: Primary Lung Tumors, J.A.M.A. 130:547, 1946.

Brahdy, L.: Leiomyoma of Lung, Am. Rev. Tuberc. 43:429, 1941.

Crimm, P. D., and Kiechle, F. L.: Fibroma of the Lung, J. Thoracic Sur. 23:205, 1952.

Forkel, W.: Ein Fall von fibromyom der lunge, Ztschr. Krebsforsch, 8:390, 1910.

Franco, E. E.: Sopra un rarissimo voliminoso leiomyoma del polmone Tumori 15:27, 1929.

Graham, E. A., and Womack, N. A.: The Problem of the So-Called Bronchial Adenoma, J. Thoracic Surg. 14:106, 1945.

Houyez: Enormous Fibroma of the Superior Lobe of the Left Lung, Ann. So. Med.—Chir. de Liége 46, 1938, Bruxelles Med. 18:1367, 1938.

Killingsworth, P. W.; Reynolds, G. S., and Harrison, A. W.: Pulmonary Leiomyosarcoma in a Child, J. Pediat. 466:470, 1953.

Lyssenkin, J. J.: Primary Tumors of Connective Tissue: Development of Xanthomatous Fibrosarcoma from Fibroma, Beitr. path. 94:49, 1935.

Pilot, I.: Mesenchymatous Tumors of the Lung and Pleura, Radiology 14:391, 1930.

Fortune sometimes makes use of our faults in order to elevate us; and there are some troublesome people whose merit would be badly rewarded if we were not very glad to purchase their absence.

Whatever distrust we may have of the sincerity of those who converse with us, we always believe that they tell us more truth than they do to others.

We have few faults which are not more excusable than the means we take to conceal them.

—*La Rochefoucauld*

Editorial

John Arderne, Father of English Surgery

IN order to appreciate fully the value and position of Master Johannes de Arderne, one must familiarize oneself with the background of the country and period in which this surgeon lived. Almost nine centuries ago the Normans invaded the British Isles and laid the cornerstone of the nation we know as Modern England. The infant nation matured slowly but soundly, so that three centuries later, with the medieval period in Europe drawing to a close, there appeared in Fourteenth Century England also a transition from a philosophy of asceticism, ecclesiastic authority and scholasticism to one of emphasis on science, skepticism and individualism. An educated man in England at that time was endowed with the new knowledge of the sciences and with teachings imparted by the early universities, yet was aware of, and often influenced by, older beliefs and traditions. The Fourteenth Century occupied a strategic position, being heir to the scientific advances of the preceding centuries and predecessor of revival of art, literature and science known as the Renaissance.

D'Arcy Power, a student of the history of English surgery, states that the King of England in this period still flew the Wessex dragon, the old flag of the Saxons, when he went to battle, and his wounded men were treated as often by charms, spells and herb magic as by clean dressings and primary suture of the bowel. During this century the country became involved in that great war with France, which is commonly known as the Hundred Years' War. Englishmen became as familiar with France, Spain and the Low Countries as they were with their own fields and woodlands. Trade was active, and large quantities of money changed hands constantly. Of all classes, the medical profession perhaps profited most. The plague of Black Death in the middle of the century, followed by a long train of epidemic illnesses, and the advent and use of gunpowder during the war, gave leeches, barbers and surgeons an abundant opportunity to practice. Victories abroad made them sanguine enough to experiment and to improve on old methods. Surgery, perhaps more than medicine, was becoming a science in England when, upon the outbreak of the domestic War of the Roses in the Fifteenth Century, all the advances were lost.

Medical science prior to the Fourteenth Century made little if any progress in England, nor do we meet before this time a single medical writer, with the possible exception of Bacon—and he can hardly be considered a medical author—who distinguished himself in the annals of medicine and surgery in the British Isles. Then, in the midst of Fourteenth-Century England appeared John Arderne, later to be known as the Father of English Surgery. His was the age that produced Chaucer, Wycliffe, Froissart, Petrarch and Guy de

---

Submitted for publication Sept. 24, 1955.

Chauliac. Autobiographic details preserved with his manuscripts, which were written in Latin and later translated, and a small body of traditional knowledge are the sources of information concerning the first English surgeon. Owing to the fact that few of these manuscripts have been printed, John Arderne has not occupied as prominent a place in the history of medicine as he might have filled.

Apparently he was a member of the family of Arderne, or Arden, and claimed descent from Saxon times, when one of his early ancestors, in imitation of the Normans, assumed a surname. To which branch of the family the surgeon belonged is unknown, as there is no reliable evidence. The date of his birth is clearly established by his own statement in his manuscript *De Cura Oculi,* which states that this treatise was written in his own hand at London in the first year of the reign of King Richard II and in the seventieth year of his age. This places the date of his birth in the year 1307. Of his early professional training little is known. The British *Dictionary of National Biography* says of Arderne, ". . . the first Englishman who displayed much skill in surgery, was a layman, not a doctor of medicine, and practiced in the time of Edward III." It has been asserted by many authors, however, that John Arderne was admitted to the University of Montpellier and that he practiced in France as a military surgeon. If this is true, Arderne attended the finest medical school of his time. Montpellier, situated in southern France, was in touch with Arabic learning and was liberal enough even then to sanction the cultivation of anatomic and surgical science; not within the walls of the university, but in extramural classes, in which, among others, Guy de Chauliac, the greatest surgical figure of the age, took part. Though there is historical doubt as to Arderne's academic medical training he was, by his own statement, a "chirugus inter medicos"—a surgeon among physicians. Could it be that he did graduate with the degree Doctor of Medicine and then took up the practice of surgery? Be that as it may, his manuscripts attest to a fairly good education, for they are written in passable Latin; he quotes freely from the Arabic and the Greek, and shows evidence of having been well read in the available literature of his profession. With regard to practical surgical training, he spent many years in France during his adventurous career as an army surgeon.

Arderne obviously practiced abroad, for in his own manuscript one finds the statement that he tried a remedy "in foreign parts upon one King and two Bishops." No doubt the King referred to by Arderne was John of Gaunt, who was also known as the King of Castile. Arderne did not mention the patient by name because the treatise was written in 1376, at which particular time John of Gaunt was considered the most hated man in Europe. Arderne's precaution was a wise one; it was but five years later when a London mob burned Gaunt's palace and killed his personal physician, merely because he was a trusted and valued friend.

In his manuscripts Arderne reveals not only his familiarity with war wounds but his intimate knowledge of several campaigns of the Hundred Years' War. If we agree with the statement of Hippocrates that "War is the only proper school of the surgeon," there is little doubt that Arderne was well grounded in the art and science of surgery. From his writings it can be deduced that he was probably a surgeon in the military service of Henry Plantagenet, the first Duke of Lancaster, and in this capacity visited Antwerp in 1338. In 1343 he went to Algeria, where gunpowder is said to have been employed for the first time. He was also present at Bergerac in 1345 and at the Battle of Crécy in 1346.

After this historic battle, at the age of 40, he returned to England a successful surgeon with many influential friends. He married and settled with Ellen, his wife, at an estate in Mitcham in Surrey, but within a year his wife died of the Black Death. His place of residence after this tragedy is recorded in an autobiographic notation which reads, "I, John Arderne from the first pestilence that was in the Year of Our Lord 1349 dwelled in Newark in Nottinghamshire unto the Year of Our Lord 1370." It is evident that he had sold his newly purchased estate and moved to Newark, where he would be welcomed by the Duke of Lancaster under whom he had served in France. In a manuscript is a record of his generous practice in Newark, where he describes treating noblemen, knights, priests, merchants, friars and the needy. During his thirty-one years there he established a large surgical practice, and when, in 1370, he went to London, he continued professional practice for six more years with remarkable vigor and success. Subsequently he issued the best known of his treatises on fistula *in ano*, with the prefatory remark that it was "written with my own hand in the year when the strong and war-like Lord [Edward the Black Prince] was taken to God." This event (the death of Edward III) took place in 1376. Thus, Master John Arderne reveals but four definite dates in his manuscripts: the date of his birth, seventy years before the first year of the reign of Richard II in 1377; the date of the Black Death in Newark in 1349; the date of his leaving Newark in 1370, and the date of his *Treatises of Fistula in Ano, Hemorrhoids and Clysters* in 1376. There is no evidence to show that Arderne was living when Henry IV came to the throne in 1399, though a deceptive note in his trea-

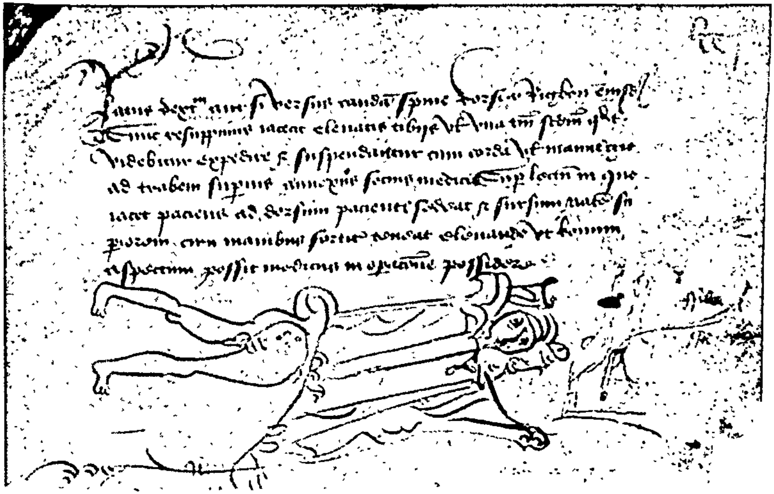


Fig. 1.—Facsimile of part of a Latin manuscript by John Arderne in the S
Washington, D. C., showing top half of page, slightly reduced (

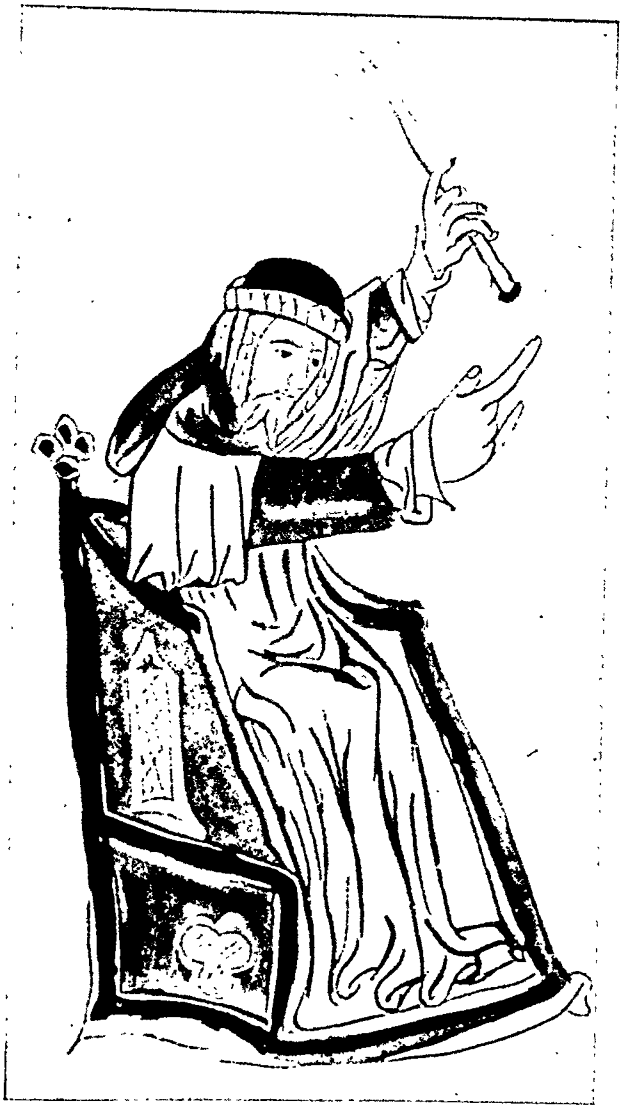


Fig. 2.—A frequently reproduced picture of John Arderne (Power[18]).

tise on fistula reads, "With this medicine was King Henry of England cured of the going out of the lure" (i.e. sloughing of the rectum). This statement was merely a side note written in a different hand into some copies of his manuscript, and crept into the English translations with the passage of time. It may be inferred, therefore, that Arderne lived until the later part of the Fourteenth Century. The date of his death is uncertain, but probably lies somewhere between 1380 and 1390.

More than 60 of Arderne's manuscripts are extant throughout the world. No fewer than 22 are in the British Museum, in the original Latin or in early English translations. Other manuscripts are in Oxford, Cambridge and Glasgow. There is a Latin version in Stockholm and a French version in Paris. In the United States, a Latin manuscript volume of the works of Arderne was acquired in 1894 by the Surgeon General's Office. This work, like those in the British Museum, is considered "invariably imperfect." Throughout the past six centuries Arderne's works have been referred to many times, yet only within this century have we had access to full and extensive texts (Sir D'Arcy Power's) containing translations of the Master's work. Power first edited a book in 1910 entitled *Treatises of Fistula in Ano, Hemorrhoids and Clysters, by John Arderne, from an Early Fifteenth Century Manuscript Translation.* His second publication, in 1922, was a translation from a copy of the Stockholm manuscript entitled *De Arte Phisicali et de Cirurgia of Master John Arderne, Surgeon of Newark, dated 1412.* Aside from several commentaries by Englishmen who have read Arderne's manuscripts, John Reed in 1588 presented a translation of the essay *Fistula in Ano,* and in 1886 there appeared in South's "Craft of Surgery" a translation of Arderne's treatise *Of the Manner of the Leech.*

The most recent reference to the technical value of Arderne's works was made by J. R. Pennington in 1923. In his text entitled *A Treatise on the Diseases and Injuries of the Rectum, Anus and Pelvic Colon,* Pennington mentioned the history of proctology with reference to its historical surgical aspect and referred to Arderne as a surgeon much in advance of his time — for today the principle of his therapy for fistula *in ano* is still used. His book includes an illustration of a part of the Latin manuscript of Arderne, now at the Surgeon General's Library (Fig. 1).

Pennington stated that the surgeon's work is original, complete, and detailed, combining well the theory and practice. Riesman has referred to Arderne as the "first proctologist." It is likely that much of his surgical experience was acquired in France, for the rigors of war of that day contributed greatly to the development of ischiorectal abscess and subsequent fistulae. One of the principal conditions that led to fistula formation in members of the nobility was the practice of sitting cold and damp for long hours in the saddle, weighed down by heavy armor. When Arderne later returned to Newark, he developed an extensive practice involving the treatment of this malady. Prior to this time fistula *in ano* was considered incurable and inoperable. The only other person to attempt its surgical treatment was an insignificant retainer of the Black Prince whom Arderne classed as a fraud.

A frequently reproduced picture of Arderne (Fig. 2) is one in which he is probing a fistula *in ano*—with the patient discreetly omitted. The original picture from Arderne's manuscript is more revealing, showing both the surgeon and the patient (Fig. 3). In both versions of the print, Master John Arderne is seen in the long robe of his profession, which distinguished him from the barber surgeons of the time who wore the short robe. Membership in the Guild of Surgeons of London gave one the right to prefix "de" to his surname, and in that manner was derived his title, Magister Johannes de Arderne.

Arderne's description of the technical work for which he is best known is extremely interesting. In writing of the treatment of fistula *in ano,* Arderne considered the influence of the moon in choosing the day for the operation, as was customary at the time. It is a great contrast to find details and opinions regarding his preparation for the surgery. He advises preoperative selection of patients whose skin is "well colored" and who are "good hearted and abiding." They should be taken "to a place made ready," that is, an operating room, where there must be good light upon the operative field. The patient should be placed in a lithotomy position. Furthermore, the surgeon requires an assistant to help him with the procedure. The patient is advised at the time of the operation to be brave and obedient, and the operation is begun.

The operation Arderne described is said to resemble somewhat that recommended by the Arabian physician Albucasis in the Tenth Century. The finger is lubricated and placed into the rectum to determine operability, for if a cancer is present the operation would not be undertaken. The

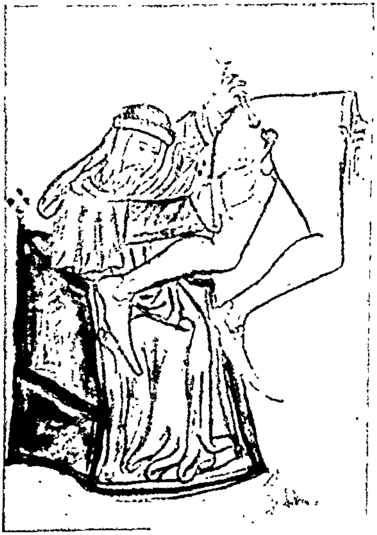


Fig. 3.—A Master of Surgery (Jo
the act of operating on a fistula *in*
Figure 2, in which the portion of
body is not shown (Power

instruments pictured (Fig. 4) are the crude ones that Arderne used. A probe (*sequere me*) is inserted into the fistula and through the eye of the probe four strands of ligature (*fraenum Caersaris*) are passed. The probe is then removed by way of the rectum, leaving the ligatures pulled through the fistula. The two ends are knotted together and the entire ligature tightened. A dilator (*tendiculum*) is then inserted into the fistula and by means of a peg (*vertile*) fixed to the widest part of the dilator, the ligature is tightened in the way that a string is tightened about a violin peg. A grooved director or snouted needle (*acus rostrata*) is passed along the fistula until it projects into the rectum, and a shield or spoon (*cochlearia*) with a depression at its center is passed through the anus until the grooved director engages in the depressed notch. The spoon protects the surgeon's own finger and also the wall of the rectum, particularly should the patient move. A lancet is then passed along the groove in the director, and the fistula is divided along its entire length by drawing the knife, dilator, grooved director and spoon out of the rectum with a single movement, the ligature coming away at the same time. Arderne specifies that each branch of the fistula must be laid open in the fashion aforedescribed. Bleeding is stopped by pressure with a sponge and the wound dressed clean with styptic powders. Arderne goes even further into detail, describing a T-bandage as being the best to apply after the operation. Postoperatively, the Master Surgeon states, the patient's bowels should not be moved for forty-eight hours, and that after a movement the area should be thoroughly cleansed and dried. When the blood has become well clotted, two or three days after the operation, soothing ointments may be applied, but no caustic substances are advised, though their use was the usual tendency in the treatment of wounds of that day. Clysters or enemas are suggested for nine consecutive days and Arderne states that by the twenty-fourth to the twenty-sixth day healing should be near completion. It is only after this that caustics may be applied. He concludes with the statement that the best sign of a cure is dry dressings. In spite of the unnecessarily complicated surgical technic, Arderne was the first Englishman to advocate a principle of treatment for *fistula in ano* that is used in part even today, the so-called "laying open" of the fistulous tract.

Power's translation of Arderne's *Treatises of Fistula in Ano, Hemorrhoids and Clysters* deals not only with the subjects indicated in the title but with cancer of the rectum, fistula of the extremities, ulcers of the leg, tenesmus, rectal prolapse, powders, oils and waters, and valences. Arderne's description of, and advice concerning, rectal carcinoma are classic, and his original observations have been altered but slightly in view of newer surgical technics. The stress he lays upon examination for "bubo within the lure" (i.e., cancer of the rectum) requires detailed consideration. I venture to suggest that this short treatise found in the fifteenth century manuscript should be required reading for all medical students and physicians, because then the importance of such an examination would be indelibly impressed upon the mind, and subsequently there would be fewer cases of far advanced rectal neoplasia.

A few salient points from Arderne's chapter on cancer of the rectum should be noted. He describes a bubo as "a tumor within the rectum which is of great hardness, but little aching. It is called 'bubo' because like Bubo, an owl, it dwells best in dark places and so this sickness lurks within the rectum in the beginning, but after a period of time it ulcerates and sloughs out." Often it causes incontinence.

The diagnosis is made by inserting the finger into the rectum and if within it is felt a hard thing, such as a stone, sometimes on one side and sometimes on both, which prevents defecation, it is a bubo. The signs of ulceration are pain, aching and sharp, that drives the patient to relieve himself two and three times every hour, and the stools are foul-smelling and streaked with watery blood. To well-meaning though unknowing doctors, as to the patient, this appears to be dysentery. Dysentery, however, is a form of diarrhea, while bubo produces hard stools, which at times cannot go past the obstruction and must be removed with the finger. Unsuspecting leeches administered drugs to stop the dysentery, but Arderne gave medicines in which experience had given him confidence. He used a simple enema of bran water or mallows, without oil, butter or other fats, since fatty substances, he thought, nourish the cancer and feed it. The symptoms of those who have bubo in the lure are not unusual at first, for they are like normal persons. Toward the end, they lose their appetite and eat less meat, which does not, however, absent them from the toilet. They often die in the autumn and, near the end, run a low-grade fever, having lost their appetite to such an extent that they crave only ale or wine. Finally, day by day, they grow more feeble until they become bedridden and take little water. Death is then at the gates; nevertheless, they may speak, lift themselves up and move about to the very end. Simple clysters relieve such a patient greatly. Care should be taken in these cases to use palliation, and friends should be warned of the incurability of the disease. Such prognostication will result in more respect for the leech's profession; therefore, one should avoid *misdiagnosis* and abstain from false treatments. Again Arderne stresses the importance of rectal examination for a patient with dysentery. In the normal person one feels nothing, but in one who has a bubo, he reiterates, there will be felt an enlarged, solid mass like "the egg of a hen or goose." Summarizing the differential diagnostic features of the two conditions, the surgeon adds that the pain of dysentery is in the navel or flanks, whereas that of the bubo is an aching, sharp, stirring pain with tenesmus and a desire to defecate. In conclusion, Arderne points out that the patients in such cases are to be treated advisedly, so that blame will not be brought upon the leech, for, he adds, he has never seen nor heard of any man cured of bubo, though he has known many who died of it.

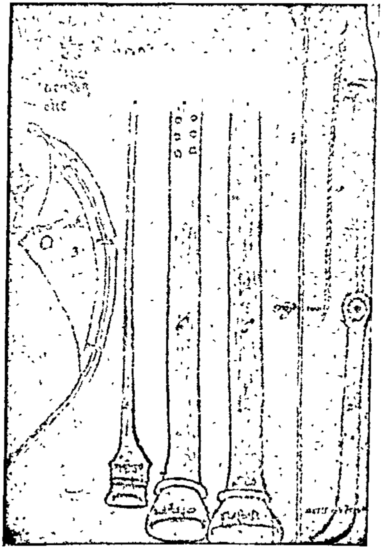


Fig. 4.—Some of the instruments used by Arderne for cure of fistula *in ano*: (1) the probe (*sequere me*); (2) the snouted needle (*acus rostrata*); (3) the dilator (*ter* [illegible] (4) a [illegible] (*fraenum Caesaris*); [illegible] *ile*); the syringe in general [illegible] (6a) Arderne's modific[illegible] [illegible] a terminal opening

It is amazing to observe the amount of knowledge possessed by this Englishman of six hundred years ago; some physicians do not appear to possess it even today.

After his discussion of cancer of the rectum, Master Arderne presents his treatment of pruritus ani and fistulas of the limbs. Notes are made on the cure of fistulas of the fingers, legs and joints — all apparently personal observations that owe nothing to tradition. In treating an inflamed sore of the leg (mormale) he advised bandaging, the use of hot and cold compresses and, later, mercurial ointment. Should dead flesh appear, he suggests that debridement be undertaken ("it is profitable to cut the dead flesh and put it away if the patient consent").

The manuscript continues with an essay on hemorrhoids. Here, for the first time, Arderne appears as a compiler, conscientiously avowing his indebtedness to the older masters of his craft, the men whose doctrines he accepted and upheld. This discussion is somewhat obscured by the nebulous theories of his predecessors in contrast to his own practical and original writings. His treatment, on the whole, is fairly sound, although he was unable to shake off some of the ancient superstitions shared alike by the wise and the foolish; for example, operations about the anus could be performed only at certain times of the year; hemorrhoids and menstruation were believed to be provoked by phlebotomy of the internal saphenous vein, while blood-letting from the external saphenous vein had a directly opposite effect. But these and other beliefs were inevitable in an age when the physiologic and astronomic dicta of the ancients were accepted as Holy Writ, unassailable by human reason and beyond appeal. It appears that other features which today we should call the nonoperative treatment of hemorrhoids differ but little from those recommended by Arderne. Styptics and soothing ointments were applied to the hemorrhoid, the cautery was used to stop the bleeding, and soothing compresses were used for inflammation, while thrombosed piles were incised and evacuated. The latter treatment, he advised, should be kept secret lest the barbers learn of this simple cure, to the detriment of the Master Surgeons. Clysters, too, were used as soon as the improved hemorrhoidal condition permitted.

In a treatise on clysters, the author finds himself once more on the safe foundation of extensive experience. He relates the details of preparing an enema and advises the use of a simple solution, the simpler the better. Into a swine bladder he would place a teaspoonful of salt, sufficient water and occasionally an equal amount of honey. Clysters, Arderne insists, require skill and should not be given by the negligent and foolish laity, for the proper administration of one he regarded as a work of perfect mystery, for which he himself had received great honor many times. The use of clysters for the diagnosis of worms is as valuable in the diagnosis of worms as is blood or pus in the stool. The administration of an enema is advised for colic and "yliac passions" [appendicitis?] and may even be given seasonally to prevent illness. The manner by which the enema relieves the patient's distress is explained by the fact that the lower part of the bowel is cleared of its superfluous contents, thus permitting the upper part to empty its contents into the now vacant lower bowel. John Arderne shows his understanding of the true value of this method of treatment when he suggests the use of a nutrient enema when a patient has no appetite.

The final section of this manuscript of Arderne's is devoted to drug preparations used in surgery. It is particularly interesting because it is full of the superstitions of Arderne's period. In spite of the confusing array of pharmaceuticals, the sur-

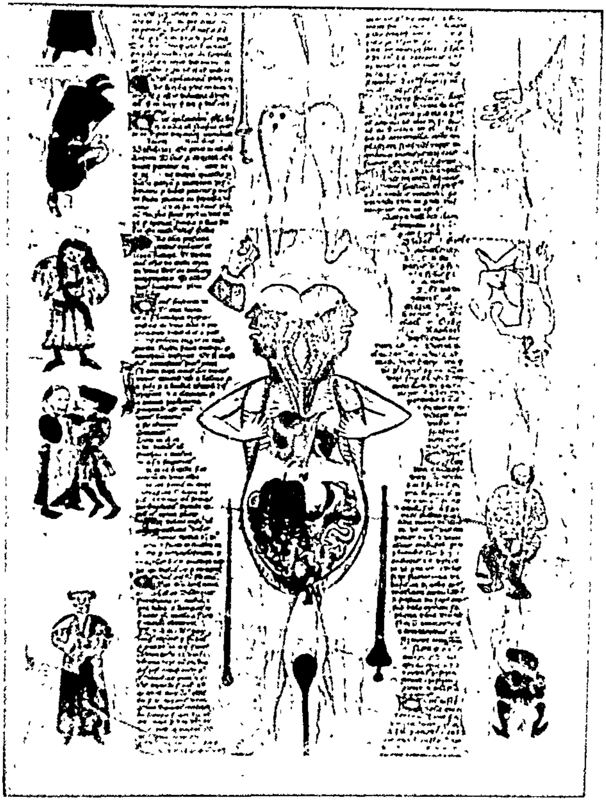


Fig. 5.—A portion of the Latin Stockholm manuscript of Arderne (Power[18]).

geon attempted to use them with judgment. With his characteristic honesty, he confessed his mistakes. Particular reference can be made to a youthful experience in which he almost killed two patients while attempting to use arsenic as a local application. As it happened, the patients survived, although necrosis of the tibia developed subsequently in each. Sequestrectomies resulted in their ultimate recovery, but as a result of this experience Arderne stressed the great care with which arsenic should be used.

From this section of his writings, we learn that John Arderne opposed "meddlesome surgery." He advised against caustics, preferred bland, soothing concoctions, would dress wounds daily or ev day, and even remarked u e sleep to the arations of his time reflected the mysticism with which the use of drugs was surrounded. One preparation, called "sanguis veneris" and composed of aloes, myrrh, blood and other drugs was used for application to ulcers and to wounds. The valued ingredient, blood, had to be that "of a maiden virgin or of a maiden damosel about 19 or 20 years who was never impregnated though she be corrupt," for, adds our observant and diplomatic author, "virgins cometh now full seldom to twenty years."

One of the most fascinating sections of this manuscript deals not with the technical aspect of surgery, but with advice to a leech on manners. To be a good surgeon, Arderne remarks, one must first set God before him in his work, and always call meekly upon Him with heart and mouth for His assistance. This concept precedes by two centuries the statement of Paré: "I dressed his wound, God cured him." Modesty and charity in the treating of poor patients must be among the leech's attributes. He should answer cautiously and let "work overcome thy word, for boasting lessenth thy reputation." He should not often be seen laughing greatly or playing, and he could be careful, too, of the company he kept. He should always be occupied in things of his craft—either reading, studying, writing or praying, for exercise with books is desirable in a leech. Above all, it is profitable to remain sober, for sayeth a wise man, "Drunkenness breaketh what-so-ever wisdom toucheth." Do not be gluttonous in strange places, he continues, and avoid scorning other leeches. If another physician's name be a topic of discussion, one should neither belittle nor praise him, but should remark courteously, "I have not any knowledge of him, but I have learned not nor I have not heard of him but good and honest." In this way more will be thought of both, for, says he, "Honor is on the one who honors and not on the honored." The Master Surgeon advises the avoidance of familiarity with patients, but adds that one should be friendly with all, including the servants. Remain chaste, says Arderne, and in addressing people be neither too rough nor too familiar, for, as the wise men say, "overmuch familiarity breedeth despising." The surgeon should not be too ready to undertake a case and should always see the patient before giving advice.

Before undertaking the operation, it is important to have a clear understanding with the patient as regards the fee. For the cure of *fistula in ano,* Arderne asked the equivalent of $500 per operation, but he adds, "Nevertheless, do another physician as he thinks better and more speedfully." Should the patient ask how much time is required for a cure, the leech should reply double the time he expects. If all goes well and the patient cures himself in half the time and then asks why, the leech should answer that it was he, the patient, who was strong-hearted and suffered sharp things well and that he was of good complexion and had able flesh to heal, and in like manner feign other causes pleasurable to the patient, for patients are proud and delighted with such words. The Master continues with his opinion of the dress of the leech. It should be "soberly," like that of a "clerke," for it is apparent that any man so clad occupies gentlemen's quarters. The leech should be clean of all blackness and filth and have clean hands and well shapen nails. He is advised to hear many things but to speak little, for "it beseemth more to use the eyes than the tongue." He is warned to beware that he be not foul-mouthed or lying, for if the words be found true, few or none shall doubt the deeds. Instead, the leech should have a store of comfortable sayings and a stock of merry tales to comfort his patients. He is admonished to recognize the effect of mind on body, for it is truly said that "one may never be in rest of body that is out of rest of soul." Finally, Master Arderne advises the leech to keep his own counsel about his patients, "for if a man see thee keep well another man's counsel he will trust better in thee."

After this brief summary of Power's translation of Arderne's *Treatises of Fistula in Ano, Hemorrhoids and Clysters,* let us consider the latest translation of the Latin Stockholm manuscript, *The Practice of Master John Arderne of Newark in the Art of Medicine and Surgery, 1412.* It is interesting that Arderne's works should have achieved such wide acclaim in his period. This manuscript was probably sent to a grandniece of John of Gaunt, who had married the King of united Norway and Sweden in 1406 and gone to live in Stockholm. The scroll is made of twelve skins of vellum about five yards in length and over a foot in width. A typical section of this scroll (Fig. 5) contains two columns of Latin script, with bordering pictures representing the diseases under consideration. A portion of the manuscript depicts cases of epilepsy, early leprosy, deafness and acne. In the center column of this selection one sees also the probing of a *fistula in ano,* as well as a sagittal section of the human body and syringes for irrigations and enemas. In the final column is shown a gouty hand, a patient with spasm (i.e., cramps), one with bleeding hemorrhoids and one patient with inflamed ones. Other phases of disease discussed in the manuscript include wounds, "yliac passions," rectal prolapse, intestinal parasites, gonorrhea and urethral stones. Therapy is even recommended for the cough of a cold, and simple remedies are offered for hiccough. The termination of the manuscript concerns the care of obstetric patients.

It appears from this manner of presentation that there existed no method or organization in Arderne's writing. He issued his writings in the form of treatises, which were collected after death, recopied, and translated at various times during the fifteenth century. These treatises actually constitute a "system of surgery" which, compiled, forms one of the epochmaking books in British surgery. The material herein describe orms a larg section of the system, al. divisions on hemor ma ich

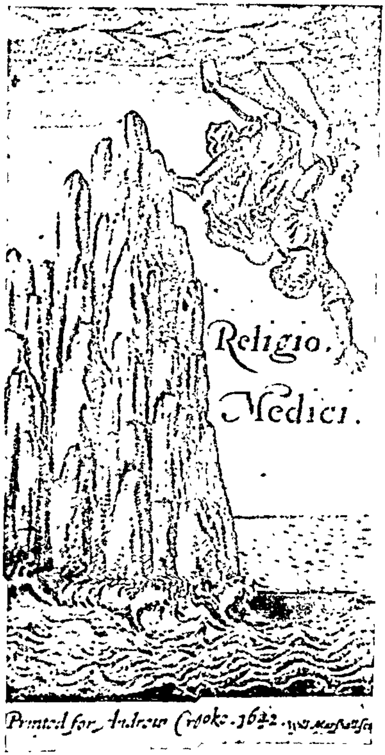


Fig. 6.—Engraved title page of the first edition of *Religio Medici,* 1642 (Keynes[6]).

and how bleeding can be stopped), diseases of the eyes, diseases of the male generative organs and the kidney, and diseases of women. There exists a supplementary section in which is described a series of interesting cases of Arderne's own. In his manuscripts are depicted many interesting features of the times, and in the illustrations accompanying them are preserved some of the famous crests of noble English families of the period. As a contemporary author he gives the sole explanation of how Edward the Black Prince obtained the ostrich feathers that have since become incorporated in the crest of the mail heir to the English throne.

Arderne's real fame lies in his contribution to the art and science of surgery. He established in his writings rules of etiquette for the surgeon of his day and the centuries to follow. In his treatise entitled "Of the Manner of the Leech" he attempted to elevate the position of surgery as it was then known, by teaching the neophyte surgeon honesty, frankness, humility, kindness, poise, professional courtesy and confidence, and a wholesome appearance supported by worldly wisdom. This wisdom was to be based upon knowledge, which in turn was based upon experience. Quoting little, yet maintaining a familiarity with the medical works of his time, he was singular in an age when most medical writers were nothing more than copyists. Of his surgical writings it has been said, "His descriptions are clear and concise; his remarks practical and full of common sense; in short, he anticipates in a startling manner those qualities which have been known in later times as characteristic of the English School of Surgery."

One is unable to omit some mention of the conflict between physician and surgeon which was waged so bitterly during his century and of which vestigial remnants exist to this day. As the finest surgeons of our day recognize the importance of being internists before becoming surgeons, John Arderne considered himself a "chirugus inter medicos," thus resolving, at least in his own life, the conflict so prevalent during his period.

Outstanding innovations of Master John Arderne were the illustrations of pathologic conditions and of the instruments he used. For the first time in English surgery there was an endeavor to convey to the reader a visual image of living pathologic change. The pedagogic principle that more is learned and retained through the visual sense than through any other is in great favor today and serves as the foundation for modern medical education. Furthermore, a compilation of series of cases with a statement of results, the very basis upon which current journals are published, can be traced back to Arderne's manuscripts. Modern writers identify patients by giving their initials, but Arderne identified them by the use of their armorial bearings. And so, six centuries ago, we see being laid the foundations of modern surgical ethics, teaching, practice and literature.

It is interesting to note that in 1928 Brown called attention to the fact that the title page of *Religio Medici,* the famous book written by Sir Thomas Browne in 1642, contains an illustration closely resembling one found in Arderne's works. According to Brown, "the first illustration of opisthotonus in medical literature" is in Arderne's manuscript (second figure, of right-hand column, Figure 5). The engraved title page of the first edition of *Religio Medici* (Fig. 6) represents a falling figure, from the mouth of which come the words "a coelo salus" (from Heaven, deliverance), while from the clouds appears a heavenly hand. Although the legs are undraped and transposed, the characteristic dorsiflexion of the head and the facial expression are similar to those in

Arderne's illustration (Fig. 7). Brown, referring back to Power's translation of Arderne's work, noted that the figure represented a patient with an interesting history of spasms or cramps. It seems that Arderne had obtained a remedy from a knight who swore he had seen a cure achieved within a few hours by placing a charm, written on parchment, about the patient's neck while those standing by said prayers. Brown concludes, "Here is the element of heavenly intercession for the saving of the figure. The addition of the rock, the sea and the heavenly hand readily suggest themselves." Thus it becomes apparent that John Arderne may have been responsible for the inspiration that produced the title page of Sir Thomas' book, which Sir William Osler recognized as the most famous book in medical literature.

The technical value of the medical and surgical knowledge produced by Arderne can be judged by the extracts from his works already presented. Short, accurate and concise descriptions of such things as tetanus, carcinoma of the male breast, gonorrhea and its treatment by irrigations, and excision of urethral stones make interesting reading and no doubt contributed to early recognition and understanding of these surgical diseases. The lesson the Master Surgeon learned centuries ago, not to confuse dysentery and other rectal diseases with "bubo in the lure" is today incorporated in the axiomatic teachings of the proctologist. The earliest understanding of surgical treatment of *fistula in ano* we owe to John Arderne. It is unfortunate that through the past centuries the English surgeons did not adhere to Arderne's principles of healing without suppuration, avoidance of irritating applications and infrequent dressings of the wound to permit healing. Of course, since he was a product of his environment, part of his medical treatment was confused by spells, herbs and nasty or innocuous substances Three of the preparations he concocted appeared in the first British Pharmacopoeia in 1618, and some of them were still in use in the eighteenth century Unfortunately, his erroneous pharmaceutical knowledge overshadowed for centuries his outstanding surgical contributions.

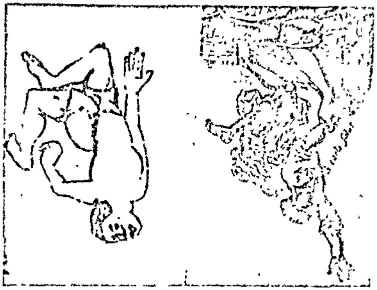


Fig. 7.—A comparison of the "falling figures" of Arderne and Browne (Brown[5]).

From the evidence presented here, one can understand why John Arderne has been called the Father of English Surgery. Some seven centuries after the establishment of England, when the history of medicine and surgery in the British Isles could be viewed with greater perspective, the importance of Arderne was gaining recognition. William Black, in 1782, wrote a book that bore the pretentious title *An Historical Sketch of Medicine and Surgery from their Origins to the Present Time and of the Principal Authors, Discoveries, Improvements, Imperfections, and Errors.* There appeared in this book a chronologic chart of medical and surgical authors. The first English surgeon listed was John Arderne, who appeared in the fourteenth century with Guy de Chauliac, the father of French surgery, as his sole contemporary. William Anderson, recognizing the importance of the contributions of Arderne, has said that "a d [illegible] men o stamp of Arderne would whole history of English surgery." In 1897 Dr. Anderson, a Fellow of the Royal College of Surgeons, delivered a paper on this fascinating surgeon before the Medical Society of London and so skillfully evaluated the importance of Arderne that his appraisal forms an applicable conclusion to this study:

"It is difficult at the present time to adjudge John Arderne's claim upon posterity, but when we remember into what low repute the art of surgery had fallen in his day in England, and how honestly and successfully he strove to elevate it by his example and teachings, we can scarcely do him too much honor. His art was not all we now understand as surgery . . . but he was a true clinical observer and based his treatment on experience and reason rather than on precedent and superstition. He was, moreover, almost the only English surgeon of his century who is known to have combined the actual practice of his calling with a scholastic training sufficient to master the surgical literature then available and to commit his views and results clearly to writing. It would be too much to expect that he should rise entirely above the astrological, humoral, and circulatory myths of his day, but he allowed his theories to influence him far less than his experience, and he stands as a singularly capable surgeon according to his lights and opportunities, holding his craft in due honor, and doing more than any other Englishman of his century or of the three following centuries to raise it in the world's esteem. If we compare him with his great French contemporary, Guy de Chauliac, we shall find in both the same straightness of purpose, the same solidity of reasoning, and the same harmless superstitions; but while Guy de Chauliac was a compiler of genius with a remarkable literary method and sense of completeness, Arderne was perhaps the better clinical student and the more practical surgeon; but as a writer, although he had considerable power of expression and an amusing aptitude for terse and pointed quotations, he was somewhat lacking in that gift of order which in an overstrained and often misapplied form distinguished the earlier European surgical authors. The Frenchman constructed a surgical text-book that in its way stood far above anything that had preceded it, and guided the whole of Europe for two hundred years; the Englishman left an assemblage of original observations that offered better lessons to his followers than could be drawn from any digest of the writings of his predecessors. It cannot be said that either added any striking facts or principles to the legacy of the Greeks.

"Of the man himself his book conveys a vivid picture. It is easy to see him as the leech of courtly and obliging manners, sober in attire and moderate in speech, and endowed with a self-restraint born of self-respect, with a tact that bore him well through the many difficulties that must have beset the thorny path of the chirurgeon in his day, and with a strong common sense that never rose too near to the dangerous level of genius; a good man and true, kindly and honest, but shrewd withal, with a quick eye to the main chance and a capacity for raising expediency to the dignity of principle. He was through all a surgeon, a scholar, and a gentleman, and in the records that he bequeathed he stands before us as one whom we, his professional descendants, may accept with pride and veneration as the Father of English Surgery."

GERALD N. WEISS,
M.D., F.A.C.S., F.I.C.S.
Lake Charles, Louisiana

BIBLIOGRAPHY

Anderson, W.: John Arderne and His Time, Lancet 2:1063, 1897.

Billings, J. S.: John Arderne and Early English Medical Writers, Bull. Johns Hopkins Hosp. 5:21, 1894.

Black, W.: An Historical Sketch of Medicine and Surgery from Their Origin to the Present Time and of the Principal Authors, Discoveries, Improvements, Imperfections, and Errors. London: J. Johnson, 1782.

Editorial: John Arderne, 1307-1380(?). Brit. J. Surg., 5:519, 1917.

Brown, A.: John Arderne, Surgeon of Early England, Ann. Med. History 10:402, 1928.

Castiglioni, A.: A History of Medicine. New York: Alfred A. Knopf, 1947.

Garrison, F. H.: An Introduction to the History of Medicine with Medical Chronology, Suggestions for Study and Bibliographic Data. Philadelphia: The W. B. Saunders Company, 1929.

Hamilton, W.: The History of Medicine, Surgery and Anatomy from the Creation of the World to the Commencement of the Nineteenth Century. London: H. Colburn and R. Bentley, 1831. 2 volumes.

Hiller, L. A.: Surgery Through the Ages (text by Paul Benton and John H. Hewlett). New York: Hastings House, 1944.

Keynes, G.: The Works of Sir Thomas Browne. New York: William Edwin Rudge, 1928, vol. 1.

Leonardo, R. A.: History of Surgery. New York: Froben Press, 1943. Lives of Master Surgeons. New York: Theodore Gau's Sons, Inc., 1948.

Mettler, C. C.: History of Medicine, edited by Fred A. Mettler. Philadelphia: The Blakiston Co., 1947.

Parker, G.: The Early History of Surgery in Great Britain; Its Organization and Development. London: A. and C. Black, Ltd., 1920.

Payne, J. F.: John Arderne, Dictionary of National Biography, edited by Leslie Stephen and Sidney Lee. London: Oxford Univ. Press, 1922, vol. 2, p. 76. On an Unpublished English Anatomical Treatise of the Fourteenth Century, Brit. M. J. 1:200, 1896.

Pennington, J. R.: A Treatise on the Diseases and Injuries of the Rectum, Anus and Pelvic Colon. Philadelphia: The Blakiston Co., 1923.

Power, D'A.: De Arte Physicali et de Cirurgia of Master John Arderne, Surgeon of Newark, dated 1412. London: J. Bale and Sons, 1922. English Medicine and Surgery in the Fourteenth Century, Lancet 2:176, 1914. Epoch-Making Books in British Surgery: I. A System of Surgery by Master John Arderne, Brit. J. Surg. 15:1, 1927. Treatises of Fistula in Ano, Hemorrhoids and Clysters by John Arderne from an Early 15th Century Manuscript Translation. New York: Oxford Univ. Press, 1910.

Reisman, D.: The Story of Medicine in the Middle Ages. New York: Paul B. Hoeber, 1935.

Windsor, T.: Biography of John Arderne, Bull Johns Hopkins Hosp. 5:67, 1894.

◆

Advice against overeating is doubtless excellent, but it is dangerous in that it affects people who need it the least—people to whom, in fact, it may prove highly deleterious. I have in mind a family which has become imbued with the doctrine of a certain gentleman who, according to his statement, is going to live to be one hundred and fifty. The result is that their five-year-old boy is eating nothing but three spinach sandwiches a day. What sort of an adult animal will that poor child grow into? . . . When it is said that the six essentials of a diet have been determined by scientific research, this does not mean that science has constructed out of a logical abstraction a phantasm called a normal diet and then found by experi*menting that it fulfils human nutritional needs.* That, *indeed, appears* to be the manner in which modern advisers of the public construct their "normal diets," but that was not the procedure of the great physiologists who laid the foundations of our knowledge of digestion and nutrition. What they did was exactly the opposite. They observed what man's average diet was and then proceeded to ascertain why it was so essential for him.

—*Clendening*

New Books

Books Received.—The following books have been received by the Editor; they will be reviewed critically as space and facilities permit. Omission of more extended review, however, is not to be taken as criticism of the merit of the book.

J.A.M.A. Clinical Abstracts of Diagnosis and Treatment. Selected by Noah J. Fabricant. New York and London: Grune, Stratton, Inc., 1955. Pp. 627 including index.

Cardiovascular Surgery. Henry Ford Hospital International Symposium. Edited by Conrad R. Lam. Philadelphia and London: The W. B. Saunders Company, 1955. Pp. 542.

Applied Medical Bibliography for Students. By William Dosite Postell. American Lecture Series No. 259. Springfield, Ill.: Charles C Thomas, Publisher, 1955. Pp. 142.

Ophthalmology. Edited by Paul C. Craig. Fort Pierce Beach, Florida: The Froben Press, 1955. Published as a memorial to the late Dr. Otis R. Wolfe.

Peripheral Nerve Injuries. Edited by H. J. Seddon. Medical Research Council Special Report, Series No. 282. London: Her Majesty's Stationery Office, 1954. Pp. 451, with 276 illustrations.

New Concepts in Surgery of the Vascular System. By Emile Holman. Springfield, Ill.: Charles C Thomas, Publisher, 1955.

Textbook of Endocrinology. Edited by Robert H. Williams. Philadelphia: The W. B. Saunders Company, 1955. 2d ed. Pp. 776, with 173 illustrations.

The Shoulder and Environs. By James E. Bateman. St. Louis: The C. V. Mosby Company, 1955. Pp. 565, with 376 illustrations. Reviewed in this issue.

Pathology. By Peter E. Herbut. Philadelphia: Lea & Febiger, 1955. Pp. 1227, with 1,378 illustrations in 661 plates, including 6 in color.

Surgery of the Small and Large Intestine. By Charles W. Mayo. Chicago: The Year Book Publishers, Inc., 1955. Pp. 340, with 94 illustrations.

Cancer Cells. By E. V. Cowdrey. Philadelphia and London: The W. B. Saunders Company, 1955. Pp. 667. Illustrated.

Suprapubic Prostatectomy. By Theodor Hryntschak, translated into English by Noble S. R. Maluf. Pp. 187, with 14 charts, 36 illustrations of operative technic, 8 roentgenograms, and photographs of the author and his clinic. Reviewed in this issue.

The Back and Its Disk Syndromes, with Notes on the Pelvis and Coccyx. By Philip Lewin. Philadelphia: Lea & Febiger, 1955. Pp. 942, with 371 illustrations, 4 in color. Reviewed in this issue.

Bickham-Callander Surgery of the Alimentary Tract (in 3 volumes). By Richard T. Shackelford and Hammond J. Dugan. Philadelphia and London: The W. B. Saunders Company, 1955. Pp. 2,755, with 1,705 illustrations and a comprehensive index of 89 pages. Reviewed in this issue.

Fractures and Joint Injuries (Volume 2). By Reginald Watson-Jones. Baltimore: The Williams and Wilkins Company, 1955. 4th ed. Pp. 1,073, with 1,613 illustrations. Reviewed in this issue.

The Collected Papers of the Mayo Clinic and the Mayo Foundation. Philadelphia: The W. B. Saunders Company, 1955. Pp. 776, with 188 illustrations. Reviewed in this issue.

AMA Scientific Exhibits, 1955. American Medical Association. New York: Grune & Stratton, 1955. Pp. 784. Illustrated.

Sachs Essays. By Ernest Sachs. Hamden, Connecticut: The Shoe String Press, 1955. Pp. 118, with frontispiece (portrait of author).

Flight Around the World and Other Poems. By Nolie Mumey. Denver, Colorado; The Ranch Press, 1956.

BOOKS REVIEWED

Gynecology; Surgical Techniques. By Robert J. Lowrie. Springfield, Ill.: Charles C Thomas, Publisher. Pp. 523.

This is the second volume on gynecology by Lowrie and is devoted entirely to surgical technics. In its preparation 58 contributors from the United States, Canada and England participated. Practically every gynecologic operation is described and illustrated. All the contributors are leading surgeons, and they have prepared chapters on subjects in which they have a special interest. In several instances the same operative procedure is presented by two or more gynecologists because their technics differ.

In addition to purely gynecologic operations, there are contributions concerning surgical procedures in related fields, such as urology and intestinal surgery. A few operations described and illustrated are at present extremely difficult to perform and require excellent teamwork from specially trained personnel. In this category are exenteration, operations for vesicovaginal fistula or carcinoma of the cervix and the vulva, transplantation of the ureters into the bowel and plastic operations on the fallopian tubes. As time goes on, more and more young gynecologists will acquire the necessary technic for these operations, all of which are described in this book.

In spite of the large number of contributors, the text is smoothly written. The illustrations are numerous, beautiful and instructive, as they should be in a book on surgical technic. Lowrie is to be congratulated on having produced an exceptional work. The publishers also deserve great credit for having accomplished their part most satisfactorily.

J. P. GREENHILL, M.D.

Surgery of the Thyroid (Chirurgie du Corps Thyroïde). By Sylvain Blondin. Paris: Masson et Cie, 1955. Pp. 292, with 37 illustrations.

This is an excellent monograph and is representative of the surgical publications presented by Dr. Henri Mondor. Like most of the other books in this collection, the contents of this volume are of distinct value in the treatment of thyroid diseases. Dr. Sylvain Blondin gives a complete résumé of thyroid abnormalities and describes the different phases in an interesting way.

His personal experience—he discusses 667 patients he has operated on—and a thorough analysis of the present knowledge of thyroid surgery make this volume desirable to all interested in the subject.

The work is divided into a number of sections. Preoperative and postoperative care, the technic of subtotal thyroidectomy and the possible complications and their treatment are meticulously presented.

This also embraces a good classification of the various types of goiters and their pathologic pictures. The surgical treatment of exophthalmos is thoroughly described. Intrathoracic goiters, the myxedemas, cancer of the thyroid, infections and various forms of thyrotoxicoses offer interesting reading and a wealth of information.

HARRY FOURNIER, M.D.

Suprapubic Prostatectomy, with Primary Closure of the Bladder by an Original Method. By Theodor Hryntschak, translated into English by Noble S. R. Maluf. Pp. 187, with 14 charts, 36 illustrations of operative technic, 8 reproductions of pertinent roentgenograms, and photographs of the author and *his clinic.*

The late Dr. Hryntschak believed that all the major methods of prostatectomy should be mastered, but he noted that the individual urologist often developed one approach which he was able to apply most efficiently and efficaciously. This monograph is a description of the author's favorite technic for suprapubic prostatectomy. It is fundamentally a variation of the Harris method and is based on the principles of hemostasis of the prostatic bed and an inverting pursestring primary closure of the bladder. A chapter is devoted to a "Comparison of the Techniques of Harris and Hryntschak."

The opening chapter, "History of Transvesical Prostatectomy and Suturing of the Bladder," is an excellent review of the development of these procedures. One is astonished at the number of technical discoveries new to our era which were suggested many decades ago.

The chapters dealing with meth [illegible] amination and with the preparati [illegible] patient for operation are [illegible] ters on [illegible] [illegible] able part of the book and worthy of careful study. Every surgical step for proper hemostasis of the prostatic cavity and primary closure of the bladder is well described and illustrated. A logical reason is given for each maneuver.

The following postoperative results are very impressive. 181 of the first 250 patients had remained in the hospital for less than fourteen days; 285 of 300 suprapubic wounds healed per priman. There were 12 fatalities in 300 successive prostatectomies; none was due to hemorrhage. It is unfortunate that the author did not live to report the five-year and ten-year results of his operations on this group of patients.

M. LEOPOLD BRODNY, M.D.

The Back and Its Disk Syndromes, Including Injuries, Diseases, Deformities and Disabilities, with Note on the Pelvis and Coccyx. By Philip Lewin. Philadelphia, Lea & Febiger, 1955. Pp. 942, with 371 illustrations, including 4 color plates.

This second edition of a book, the first edition of which was accepted and used very widely by orthopedic surgeons, represents a careful condensation of the orthopedic literature dealing with the problems of back pain and disability.

Much of the material consists of the conclusions and opinions of Lewin himself, whose experience over many years has been wide and varied. Some of the illustrations in the book are photographs or roentgenograms of Lewin's own patients, and in most instances the patients were positioned and prepared under his personal direction. This book deals with the anatomy, diagnosis and treatment of diseases and injuries to the back, including the disk syndrome.

Philip Lewin is professor emeritus and former chairman of the Department of Orthopedic Surgery, Northwestern University Medical School. He is also Professor of Orthopedic Surgery in the Cook County Graduate School of Medicine of Chicago, Senior Attending Orthopedic Surgeon at Michael Reese Hospital and Consulting Orthopedic Surgeon of the Cook County Hospital, Chicago.

The line drawings in this book are of exceptionally fine quality. These were made by Harold Laufman, a physician and surgeon, whose artistic ability is exceptionally high. This is merely one of a number of surgical texts, the value of which has been greatly enhanced by Laufman's illustrations.

This is a reference book. The biographical references in the appendix constitute the most comprehensive list this reviewer has ever seen in any orthopedic reference or text having to do with the diseases and injuries of the back. The book should be in the library of every orthopedic surgeon and every industrial surgeon, as well as others who are interested in the general problems of disease or trauma of the bones and joints.

EDWARD L. COMPERE, M.D.

Bickham-Callander Surgery of the Alimentary Tract. In 3 volumes. By Richard T. Shackelford and Hammond J. Dugan. Philadelphia and London: The W. B. Saunders Company, 1955. Pp. 2,755, with 1,705 illustrations and comprehensive index of 89 pages.

Bickham's *Operative Surgery* has been a classic for some decades. Many of us remember and retain in our libraries sets of this splendid work. The original work was completed by Dr. Warren Stone Bickham in New York in 1924. It was a monumental six-volume presentation of the technics of general and special surgery. A revision of the original work after the death of Dr. Bickham was entrusted to Dr. C. Latimer Callander of California, who engaged in the project from 1938 until his death in 1947. Those of us who knew Dr. Callander appreciate the conscientious effort he put into this undertaking. Dr. Richard T. Shackelford and Dr. Hammond J. Dugan were entrusted with completion of the present work.

With the aid of a number of competent surgeons, the work in its new form has emerged as an up-to-date authoritative presentation of present-day surgery of the alimentary tract.

The three volumes comprise thirteen chapters, each of which is handled lucidly and thoroughly. It begins with diseases of the esophagus and concludes with hernia of the gastrointestinal tract and incisions. To single out a given section would be fruitless. This reviewer comments on the entire opus as such. It is well presented and adequately and well illustrated, and can be highly recommended to all surgeons desiring to review the present status of gastrointestinal surgery. An excellent feature is that the anatomic aspects of the parts concerned are thoroughly described and depicted and, where indicated, the embryologic and histologic, as well as the physiologic aspects are described. General surgical considerations, as well as exposure of the organs concerned and the various technics, are brought into sharp focus.

It is a magnificent work and does honor to the memory of both Bickham and Callander, as well as to Dr. Shackelford and Dr. Dugan.

MAX THOREK, M.D.

The Shoulder and Environs. By James E. Bateman. St. Louis: The C. V. Mosby Company, 1955. Pp. 565, with 376 illustrations.

The author of this book is Orthopaedic Consultant of Sunnybrook Hospital, Toronto, Canada, and has had a wide experience in the diseases and injuries of the shoulder, as well as other orthopedically important regions of the human body. This is a reference book rather than a textbook. It is illustrated with roentgenograms, photographs and a large number of excellent line drawings. The print is small, but the letters and words are clearly presented and the text easy to read.

The first chapter is entitled, "Evolution and Applied Embryology of the Shoulder Region and contains many interesting illustrations, showing evolutional development through the ages. Anatomy is discussed from the standpoint of applied, variational and radiographic anatomy. Physiology is discussed, with emphasis upon function. Technics and methods used in examination of the shoulder are well presented. Differential diagnosis is fully discussed, and therapy of the various and multitudinous lesions that may occur in the shoulder joint and its environs is presented with clarity and good judgment.

EDWARD L. COMPERE, M.D.

Fractures and Joint Injuries. By Reginald Watson-Jones. Baltimore: The Williams and Wilkins Company, 1955. 4th ed., vol. 4 Pp. 1,073, with 1,613 illustrations.

At long last, the surgeons who are concerned with the problems of injuries to the spine and extremities, including fractures and dislocations, will be able to obtain the fourth edition of Volume 2 of *Fractures and Joint Injuries* by Watson-Jones. Since the first edition was published, in January 1940, as a single volume dealing with these problems in the most precise and orderly manner, Watson-Jones has been the most popular of all reference books on fractures and dislocations. The third edition was published as two volumes in 1943, and Volume 1 of the fourth edition appeared in January 1952. When one takes into consideration the tremendous amount of work that has gone into this fourth edition, Volume 2, the rewriting of entire chapters, the changing and adding of many illustrations, so that Volume 2 is now approximately as large as the earlier editions which combine the material of two volumes into one, it is not difficult to understand why it has taken more than three years to bring out the fourth edition of Volume 2. The book is well worth waiting for.

Sir Reginald Watson-Jones is known at least by name to surgeons around the world. He is Extra-Orthopaedic Surgeon to Her Majesty The Queen; Orthopaedic Surgeon to His Late Majesty King George VI; Director, Orthopaedic and Accident Service, London Hospital; Senior Surgeon, Robert Jones and Agnes Hunt Orthopaedic Hospital, Shropshire, England; and Civilian Consultant in Orthopaedic Surgery of the Royal Air Force. He has been continuously, from the time the first issue was planned, British Editor of the *Journal of Bone and Joint Surgery.*

This is, indeed, a reference book intended for the experienced orthopedic or fracture surgeon, as well as those who are still studying and learning the basic technics. The printing is clear; the diction is scholarly but easy to read and understand. No text known to this reviewer has ever been better illustrated. A few color prints add a great deal to the beauty of this book and make the artists' drawings more readily understood.

This latest edition of a monumental work will be received with the same enthusiasm as were the earlier editions by the orthopedic surgeons and surgeons of trauma, throughout the English speaking nations of the world, and by the same groups of surgeons in many other countries as well.

EDWARD L. COMPERE, M.D.

The Collected Papers of th
and the Mayo Foundation.
The W. B. Saunders Com y..1
with 188 i

The

in charge of the section of publications at the Mayo Clinic. Its material was selected primarily with the interests of the general practitioner and the general surgeon in mind. There is quite a bit of material, representing all of the specialties, which presents fairly adequately the work of the Mayo Clinic and Foundation. The contents are divided into twelve chapters. These are classified primarily according to the specialty concerned—radiology, dermatology, neurology, anesthesia and physical medicine.

The rest of the book is divided into physiologic sections: the alimentary tract, the genitourinary tract, the ductless glands, the blood and circulatory organs, and the thorax, head, trunk and extremities. There is also a section on miscellaneous subjects; it contains two excellent chapters, one on the use of antibiotics and another called "The Difficult Patient."

The contributors are all men who work at and with the clinic and foundation. The proceedings of the staff meetings of the Mayo Clinic are represented by some excerpts. Of the 629 papers presented, 94 are from the Proceedings of December 1953, to November 1954.

The book is excellent. In trying to describe or project the idea contained within the collected papers of the Mayo Clinic, this being their forty-sixth edition, one has the feeling that he is describing a tree after examining carefully one of its smallest branches. The book is thorough and complete. It presents many subjects that are problems to most general surgeons and to practicing physicians in general. It is highly recommended to surgeons in particular and to all doctors practicing any type of medicine.

JEROME J. MOSES, M.D.

◆

Guilt has always its horrors and solicitudes; and, to make it yet more shameful and detestable, it is doomed often to stand in awe of those to whom nothing could give influence of weight but their power of betraying.

The mischief of flattery is, not that it persuades any man that he is what he is not, but that it suppresses the influence of honest ambition by raising an opinion that honor may be gained without the toil of merit.

Long customs are not easily broken; he that attempts to change the course of his own life very often labors in vain.

Abuse is not so dangerous when there is no vehicle of wit or delicacy, no subtle conveyance. The difference between coarse and refined abuse is as the difference between being bruised by a club and wounded by a poisoned arrow.

—*Johnson*

Abstracts from Current Literature

Association of Irradiation With Cancer of the Thyroid in Children and Adolescents. Clark, D. E., J.A.M.A. 159:1007, 1955.

Fifteen children between the ages of 4 and 15 years, with carcinoma of the thyroid, had all been treated with roentgen therapy in infancy and early childhood for benign conditions of the head, neck and thorax.

Of the 15 patients, 14 were girls. The interval between irradiation and diagnosis of the neoplasm was three to ten years, with an average of six to nine years. In 11 of the cases the total dose (in air) ranged from 200 to 275 roentgens. This observation is supported by the report of Simpson, Hempelmann and Fuller, who studied a series of 1,722 children who had been treated by irradiation. The thyroid tumors that developed in the group were all in patients who had received more than 200 roentgens. Of the entire group 604 (35 per cent) had received under 200 roentgens; in none of these had any tumor of the thyroid gland developed at the time the report was made.

During recent years carcinoma of the thyroid in children has been diagnosed with increasing frequency. In the absence of contradictory testimony this has been regarded as representing a true increase, which observation seems to correlate with the greater use of roentgen therapy for benign conditions about the head, the neck and the upper portion of the thorax.

This pointed suggestion that prior irradiation about the neck in early life may be a causative factor in the development of carcinoma of the thyroid in children and adolescents is clearly deserving of further investigation.

THOMAS WILENSKY, M.D.

Invasive Carcinoma of the Cervix in Young Women. Decker, D. G., Fricke, R. E., and Pratt, J. H., J.A.M.A. 158:1417, 1955.

The authors report that no essential difference has been noted, in the end results of treatment, between women under 35 years and women over 35 in 169 cases of invasive carcinoma of the cervix.

A relative five-year survival rate of 53.5 per cent was obtained. These figures are in agreement with those of other observers. As many others have indicated, there is a grievous delay in diagnosis owing to the physician's misinterpretation of relatively minor symptoms. This is the area in which it would seem that the greatest advance could be made. Nothing can replace an adequate pelvic examination, visualization of the cervix and proper cervical biopsy in the armamentarium of the gynecologist. Once the diagnosis has been made, there should be no hesitation to proceed with complete treatment of the lesion, because of the age of the patient and the effect of an artificial menopause brought about by operation or irradiation. From this study the authors conclude that carcinoma of the cervix in the young woman is as malignant as in the over-all age group but no more so. Early diagnosis, adequate treatment, and careful follow-up are nowhere more necessary than in dealing with the condition in young women.

EDMUND LISSACK, M.D.

Les métrorragies: Signes des phlébites pelviennes latentes (Metrorrhagia as a Sign of Latent Pelvic Phlebitis). Bret, J.; Duperrat, B., and Grenier, B.: Presse Méd. 63:181, 1950.

Latent venous thrombosis in the pelvis, especially in the utero-ovarian system, up to the present, had been recognized only in the field of degenerating fibromyomas. Hysterectomy in such cases was often complicated by extensive phlebitic phenomena, the cause of which remained a mystery.

Contrary to general opinion, the authors are convinced that latent and spontaneous thromboses of the pelvic venous plexus in the woman constituted a clinical entity. The condition manifests itself primarily as metrorrhagia and can appear at any age. It is considered necessary to recognize this syndrome, as rational treatment depends its early diagnosis.

Detailed clinical and histop
ies of the condition in wom
maturity, at the premenopau

the postmenopausal years are given. The main clinical characteristic of these thromboses is metrorrhagia that does not respond to hormonal or other usual treatment, is not "functional" and recedes satisfactorily with anticoagulant therapy.

Therefore, in a case of uterine bleeding that does not improve with the accepted methods of treatment, and in which there are also varicose veins or a history of phlebitic accidents, pelvic phlebitis can be suspected and the diagnosis confirmed by endometrial biopsy. This reveals thrombotic lesions of varying degrees, some of them in the process of organization.

Early diagnosis is important because it indicates not only that hysterectomy may be avoided but that it is contraindicated. Hormonal treatment is also of no avail, and the condition responds very well to anticoagulants.

This work, well written and richly illustrated, introduces a "new" cause of uterine bleeding.

WILLIAM E. NORTH, M.D.

Surgical Treatment of Coronary Insufficiency. Briggs, J. M., and Byron, F. X., World J. Surg., Obst. & Gynec. 63:559, 1955.

The authors present a short historical summary of the problem and state that three procedures have had an acceptable amount of clinical try-out: pericardial poudrage, internal mammary implantation and arterialization of the coronary sinus. They favor the cardiopericardiopexy or pericardial poudrage of Thompson, because it is technically simple, requiring very little equipment and no specialized training. The operation utilizes all available collaterals, the pericardial-phrenic arteries, the internal mammary arteries, the inferior phrenic arteries and the adjacent mediastinal vessels. It carries the lowest mortality rate and gives results equal to those obtained with the other operations. Briggs and Byron express the opinion that candidates for the operation should be patients in whose cases medical treatment has failed and who have had uncontrollable pain and symptoms for at least one year. The heart may be moderately enlarged, but patients with heart failure are not considered. There are no age limits, but there is more risk with young patients. Operation should not be performed within three months of the occurrence of an infarct, and preferably six months should have elapsed.

The authors modify the original Thompson technic thus: They make a short anterior intercostal incision in the fourth or fifth interspace, preserving the mammary vessels, enter the pleura, which allows the lung to be collapsed and retracted away, and then incise the pericardium anterior to the phrenic nerve and along its axis. All pericardial fluid is aspirated with a soft urethral catheter, and about 4 drams of U. S. P. talc is introduced into the sac and spread well over the myocardium. If some talc spills outside the sac, it will add to the inflammatory reaction and bring new vessels from the pleura and lungs. The pericardium is tightly closed. Using Thompson's criteria for evaluating results (decrease in the amount of anginal pain; increase in exercise tolerance; improved ability to attend to daily needs, and return to former or some gainful occupation) they cite their experience with 8 patients during the past two years and conclude that in 3 the results were good and in 2 apparently good. There were 3 deaths, 1 operative, the other 2 later (six and fourteen months respectively). The operative death was due to fresh infarction on the sixth postoperative day.

WARREN A. YEMM, M.D.

Noninvasive Malignancy of the Vulva. Collins, C. G.; Kushner, J.; Lewis, C. N., and Lapointe, R., A. A. of Obst. & Gynec. 6:339, 1955.

Therapeutic procedures applied to malignant disease of the vulva have been many and diverse. Irradiation, employing radium or roentgen rays, has its advocates either as the treatment of choice or as an adjunct to operation. In irradiation centers, nevertheless, some consider operation the method of choice.

The diagnosis of noninvasive malignant tumor of the vulva is made by examination of multiple microscopic sections and by signs showing that the malignant growth is limited to the epithelium.

In all cases of suspected malignant disease of the vulva, a venereal disease survey is as imperative as is a biopsy.

Complete (radical) vulvectomy suffices for the cure of noninvasive malignant tumors of the vulva. Regional gland dissection is not necessary.

EDMUND LISSACK, M.D.

Surgical Closure of Ventricular Septal Defects. Cooley, D. A., Surg., Gynec. & Obst. 101:153, 1955.

Ventricular septal defects larger than 1.5 cm. in diameter and situated in the high membranous portion of the septum usually cause significant cardiac disability, as they remain patent throughout the cardiac cycle.

Surgical closure of interventricular defects is hazardous, and relatively few successful methods have been reported.

Dr. Cooley's preliminary report is based on experience with 2 patients in whom high septal defects were surgically improved by a method modified from previously reported technics in which mattress sutures are passed through the upper third of the ventricular septum. Both patients survived the operation at 18 months and 9 years of age respectively and showed early indications of improvement.

THOMAS WILENSKY, M.D.

New Physiologic Concepts Related to the Surgical Treatment of Duodenal Ulcer by Vagotomy and Gastroenterostomy. Oberhelman H. A., Jr., and Dragstedt, L. R., Surg., Gynec. & Obst. 101:194, 1955.

In a review of the causes of recurrent ulcer following vagotomy alone and vagotomy with gastroenterostomy the authors express the opinion that several mechanisms are responsible. Incomplete vagotomy may be responsible for the recurrence of ulcers. Complete vagotomy alone may produce gastric stasis to a degree that unduly prolongs the hormonal phase of gastric secretion. This increase in gastric secretion, due to a prolongation of the humoral mechanism of secretion after vagotomy alone, can be prevented by gastroenterostomy. When this is done, however, it is essential that the gastroenterostomy stoma be placed in the gastric antrum, close to the pylorus, so that gastric stasis may be prevented. Placing this stoma high on the fundus or away from the antrum does not effectively prevent gastric stasis, and as a result gastric hypersecretion occurs, owing to hormonal stimulation.

In analyzing their failures, the authors concluded that stasis of food in the stomach and a high-lying gastroenterostomy stoma were important factors in many cases. An additional factor was the development of pyloric stenosis as a result of the healing of ulcerative lesions. When this occurs and gastric stasis results from a stoma not adequately placed, ulcers are likely to form.

The experimental and clinical observations suggest that in the performance of gastroenterostomy and vagotomy the stoma should be placed in the antrum 4 or 5 cm. from the pylorus.

M. O. CANTOR, M.D.

A Study of 50,000 Specimens of the Human Vermiform Appendix. Collins, D. C., Surg., Gynec. & Obst. 101:437, 1955.

This is the author's twenty-third publication on the human vermiform appendix, derived from a continuing study started in 1924. Eleven leading hospitals and over 250 skilled surgeons supplied the material for the statistics quoted.

Slightly more than 57 per cent of all surgically removed appendixes were within normal limits.

A recent restudy indicated that certain lesions, notably histoplasmosis, marked hyperplasia of both Meissner's and Auerbach's plexuses and even large neurofibromas were commonly overlooked in the formative years of this study.

A review of earlier microscopic slides of the appendix indicated that at least 7.81 per cent presented the characteristic histoplasma capsulatum (Darling), most often in the "germinal centers" of the submucosal lymph nodes. This has been interpreted as pointing to an unsuspected incidence of a benign juvenile type of histoplasmosis in America.

Many interesting and unusual lesions were observed, including 4 examples of proved congenital agenesia, 2 instances of true congenital duplication and 15 patients with situs transversus viscerum abdominis.

Twelve tables of statistics provide this paper with its most interesting and instructive details. For example, 956 vermiform appendixes harbored 18 varieties of worms.

Among the 50,000 specimens there were 632 primary malignant tumors, 270 of which were perforated appendiceal mucoceles producing pseudomyxoma peritonaei. In the same category 261 carcinoid tumors were placed. Of these, 222 were localized to the appendix and 39, a surprisingly high number, were reported as metastasizing.

Primary adenocarcinomas were observed in 41 instances.

This article, with its bibliography, presents a wealth of material to the student of the human veriform appendix.

THOMAS WILENSKY, M.D.

Indications for the Surgical Treatment of Gastric Ulcer. Kelley and Larimore, Southern M. J. 48:376, 1955.

There is little difference of opinion with regard to the treatment of the perforated ulcer, the grossly obstructive ulcer, the intractable bleeding ulcer, the deeply penetrating ulcer with extragastric pocket or the ulcer whose characteristics, judged by objective tests, are those of a primary malignant tumor.

The authors discuss the uncomplicated gastric ulcer, which presents a total clinical picture suggesting a benign lesion. Competent authorities, both medical and surgical, have advocated surgical treatment of this lesion. Such advice has been given because (1) resection is considered most effective in relieving symptoms, and (2) by resection, cancer of the stomach is being prevented or cured.

The authors examine the validity of some of the major reasons advanced for surgical treatment. It is concluded that uncomplicated gastric ulcers should not be removed to prevent the development of cancer or because of a possible confusion of diagnosis. In cases of presumably benign disease, the therapeutic trial should be conducted without urgency, and any decision as to change in therapeutic approach must be made on an evaluation of the total clinical picture in the individual case. Generalizations concerning the size of the crater, the location of the ulcer, the age of the patient, the duration of healing time, etc., can serve as guides to treatment, but none of them, taken individually, can be used as an arbitrary indication for surgical intervention.

The medical treatment of gastric ulcer is admittedly unsatisfactory. Too many patients relapse and too many undergo complications that will eventually require surgical treatment. The solution is not to be found in resection of all gastric ulcers. The solution lies in discovering the initiating factor, perfecting the available means of controlling gastric acidity, and educating physicians and patients alike as to the need for following a medical disciplinary regime during remission as well as during relapse.

WILLIAM E. NORTH, M.D.

◆

Last year, in discussing some public remarks which I made jointly with the Professor of Biology at the University of Kansas, a clergyman arose to announce that "scientists must make their discoveries harmonize with the beliefs of the American people," and neither then nor at any later time did he appear to realize the enormity of what he had uttered—how blasphemous it was, how immoral. Because, translated into his own phraseology and philosophy, what he said was that if a man discovered one of God's truths and that truth was not what the American people believed, he must announce that the truth of God which he had discovered was a lie. Yet this minister's statement was a revelation of the real and unconscious attitude of his soul.

—*Clendening*

COLLEGE INTERNATIONAL DE CHIRURGIENS

FOUNDED BY DR. MAX THOREK

The Journal of the International College of Surgeons

Official monthly publication of the International College of Surgeons

Editor-in-Chief
MAX THOREK, M.D., Sc.D., LL.D., F.B.C.S., F.I.C.S., F.P.C.S. (Hon.), F.R.S.M.

Associate Editor
PHILIP THOREK, M.D., F.A.C.S., F.I.C.S.

Consulting Editor
MORRIS FISHBEIN, M.D., F.I.C.S. (Hon.)

Assistant Editors
DOROTHY LANGLEY AND PAULA GOLICK

Specialty Editors

Cardiovascular Surgery
Bert Hollis Cotton, M.D., F.I.C.S., D.A.B.
Los Angeles, California

Genitourinary Surgery
Michael K. O'Heeron, M.D., F.A.C.S., F.I.C.S
Houston, Texas

Neurologic Surgery
James W. Watts, M.D., F.A.C.S., F.I.C.S.
Washington, D. C.

Obstetric and Gynecologic Surgery
J. P. Greenhill, M.D., F.A.C.S., F.I.C.S.
Chicago, Illinois

Occupational Surgery
Chester C. Guy, M.D., F.A.C.S., F.I.C.S.
Chicago, Illinois

Ophthalmologic Surgery
Paul C. Craig, M.D., F.A.C.S., F.I.C.S.
Reading, Pennsylvania

Orthopedic Surgery
Edward L. Compere, M.D., F.A.C.S., F.I.C.S.
Chicago, Illinois

Otolaryngologic Surgery
Francis L. Lederer, M.D., F.A.C.S., F.I.C.S.
Chicago, Illinois

Plastic and Reconstructive Surgery
Neal Owens, M.D., F.A.C.S., F.I.C.S.
New Orleans, Louisiana

Proctologic Surgery
Harry E. Bacon, M.D., F.A.C.S., F.I.C.S.
Philadelphia, Pennsylvania

Surgery of Thyroid, Parathyroids and Thymus
Arnold S. Jackson, M.D., F.A.C.S., F.I.C.S.
Madison, Wisconsin

Thoracic Surgery
Thomas J. Kinsella, F.A.C.S., F.I.C.S.
Minneapolis, Minnesota

Allied Sciences
Dr. Paul Bernard Szanto, F.A.C.P., F.I.C.S.
Chicago, Illinois

Official Journal of the International College of Surgeons, Published Monthly
PUBLICATION OFFICE: 1516 Lake Shore Drive, Chicago 10, Ill.
Entered as second class matter at the post office at Chicago, Ill. under the act of March 3,
Yearly Subscription: Domestic and Foreign, $12.00
Copyright 1956, by the International College of Surgeons

The Journal of the International College of Surgeons

Official monthly publication of the International College of Surgeons

CONTENTS

VOLUME XXV, NUMBER 3
MARCH 1956

ABDOMINAL AND GENERAL SURGERY

Artificial Hibernation 271
Carlos Gama, M.D., F.I.C.S., and Flavio Sylos, M.D., São Paulo, Brazil

Jejunostomy 278
João de Resende Alves, M.D., F.I.C.S., Belo Horizonte, Brazil

Leiomyosarcoma of the Jejunum 254
John Harrington Tanous, M.D., F.I.C.S., and Ira Jay Lien, M.D., Miami Beach, Florida

Peptic Ulcers in Africans of the French Cameroons 289
V. A. Reihmer, M.D., A.I.C.S., French Cameroons, Africa

CARDIOVASCULAR SURGERY

Cardiac Arrest Associated with Coronary Occlusion: Successful Resuscitation 299
Attilio Celio, M.D., Basel, Switzerland

Intrahepatic and Extrahepatic Portal Venous Thrombosis: Report of a Case 306
Waldyr da Silva Prado, M.D., F.B.C.S., F.I.C.S., and José Luiz Camargo Barbosa, M.D., São Paulo, Brazil

GENITOURINARY SURGERY

Diagnostic and Therapeutic Problems Incident to the Surgical Treatment of "Malignant" Renal Calculous Disease 310
Fred K. Garvey, M.D., F.A.C.S., D.A.B., and William H. Boyce, M.D., F.A.C.S., Winston Salem, North Carolina

NEUROLOGIC SURGERY

Management of Post-Traumatic and Postoperative Spastic Paralysis 327
Temple Fay, M.D., F.A.C.S., F.I.C.S., Philadelphia, Pennsylvania

OBSTETRIC AND GYNECOLOGIC SURGERY

Current Fallacies of Statistical Records on the Radical Operation of Wertheim for Carcinoma of the Cervix 340
N. C. Louros, M.D., F.I.C.S. (Hon.), Athens, Greece, and Louis Wolfe, M.D., New York City, New York

ORTHOPEDIC SURGERY

Use of the Extra-Long Trochanteric Plate for Severely Comminuted Fractures of the Femoral Shaft and the Subtrochanteric Area 348
W. Compere Basom, M.D., F.I.C.S., M.S. (Orth.), D.A.B., El Paso, Texas

COLLEGE INTERNATIONAL DE CHIRURGIENS
GENEVE
FOUNDED BY DR. MAX THOREK

The Journal of the
International College of Surgeons

FOUNDED IN GENEVA, SWITZERLAND, 1935 - INCORPORATED IN WASHINGTON, D. C., 1940

Vol. XXV MARCH, 1956 No. 3

Abdominal and General Surgery

Artificial Hibernation

CARLOS GAMA, M.D., F.I.C.S.*
AND
FLAVIO SYLOS, M.D.**
SAO PAULO, BRAZIL

THE method of artificial hibernation devised by H. Laborit, which at first seems revolutionary, has opened an immense field of research in physiopathology. Evidently the philosophy of Laborit and his followers has a concrete physiologic basis, but the method needs further investigation and technical improvements.

"Artificial hibernation" is the term used by Laborit and others to describe the status of the patient after the administration of the "lytic cocktail" composed of thorazine, demerol and phenergen. These workers in France and elsewhere claim that these agents create partial blockage and depression of the autonomic and central nervous systems, thus allowing less noxious influences, such as surgical shock, hemorrhage or trauma, to alter the patient's circulatory equilibrium and other essential processes.

The basal metabolic rate is reduced; the associated hypothermia reduces oxygen demands; analgesic and anesthetic agents are potentiated so that less are required, and, supposedly, insults to the body such as radical operation on the "poor risk," which might prove fatal to a patient not under artificial hibernation, may now be performed.

For Laborit, hibernation is not hypothermia and least of all hypothermia un-

---

Submitted for publication Dec. 24, 1955.

*Chief of the Neurological Service, Santa Casa de Sao Paulo.

**Doctor of the Anesthesia Service of Santa Casa de Sao Paulo.

LIBRARY OF THE

der narcosis as observed by Simpson and Temple Fay (1938) and Allen (1942). Cold is a serious noxious agent, leading one's defenses to disequilibrium and exhaustion. The general anesthetics and barbiturates, although efficient in interrupting the sensation of freezing, do not block sufficiently to prevent the discharge of epinephrine and its effects on peripheral arteriocapillary vasoconstriction and anoxia. Laborit, basing a theory on the teaching of Leriche and Reilly's school of thought as to the physiopathology of the neurovegetative system, proposed a way of blockading it. There was then conceived the theory of neuroplegia, narcobiosis, controlled inhibition of the neurovegetative system, potentialized anesthesia and controlled hypothermia.

Numerous drugs have been used for this purpose; they have been used in small doses over prolonged periods and with low toxicity. A mixture of drugs in minimum doses has been established and by analogy has been referred to as a "cocktail." As new drugs are discovered and used, pharmacologists may be expected to improve their effectiveness. The failures of artificial hibernation are probably not due to the principles synthesized by Laborit but to deficiencies in the technics and drugs currently employed.

Many drugs have already been rejected because their essential pharmacologic action does not compensate for their secondary reactions. On the other hand, some drugs which were previously condemned are now used, with some result. Thus, if homeostatic regulation is blocked with lytic "cocktails," the organism is cooled directly, without resistance, entering into retarded and economical life, which places the organism in a state of "chronic shock" and thus enables it to resist harmful influences. Laborit names this state "artificial hibernation," in analogy to the condition of hibernating animals.

Physiopathologic Aspects of the Post-Aggressive State.—Creatures in general react in different ways to the stresses and strains of their environment. Their responses to these aggressions would be three: (a) reaction; (b) training, and (c) adaptation.

Reaction: Claude Bernard observed, as long ago as 1878, that "all the vital mechanisms, however varied they may be, have only one object, that of preserving constantly the conditions of life in the internal environment." Cannon completed this observation in 1929 with the expression of homeostasis. The exact maintenance of homeostasis in man is a benefit of his evolution in the zoologic scale. Lower animals react to the aggressions of their environment by adaptation that is completely physical. Evidently Quenu's toxemic theory (1918), the Blalock-Phemister theory (1928-1930) of the loss of liquids and Cannon's exemia theory (1919-1923) are not sufficient to explain the state of shock. Friedmann in 1933, Slome in 1934 and O'Shaughnessy in 1935 explained the state of shock on a neurogenic basis: "Shock is the effect of the exaggerated activity of the autonomic nervous system and the adrenals."

The predominance of the neuro-vegetative phenomena in the anoxic phase of the shock were explained only by Leriche and Reilly. Davis, in 1948, in his last work about shock, tried to throw new light on the problem, presenting the most important theories to explain the postaggressive state. He discussed the three phases of the state of shock, the first being the anoxic one and the last the catabolic and anabolic. In 1940 Seyle, Dosne, Basset and Whitaker defined shock as general, sudden organic damage, calling attention to the neuroendocrine phenomena. Davis criticized Selye's work in explaining his conception of shock and countershock, saying that not everything that happens in the phase of countershock brings benefit.

It is admitted today that the organism reacts with consistency to several aggressions, and Selye shows the importance of this hypophysis-adrenal reaction. It is characterized by the usual syndrome: vasodilatation, capillary edema, hyperpermeability edema and multiple infarcts, which are Reilly's phenomena. They may be started by neurovegetative reflex (splanchnic irritation reflex); a single drug is unable to block or protect any animal with splanchnic irritation. The same can be said of the sympathicolytic and parasympathicolytic; the use of combined drugs protected the animal from the splanchnic irritation phenomena. Laborit studied these oscillations after aggressions in the human being, calling them the oscillant postaggressive reactions, which, as he says, may be harmonious or unharmonious. Thus, examining the curves of the metabolic modifications (minerals, diastasic hormonal or neurohormonal secretions, by bicarbonates, protein metabolism diastonic activities) it was observed that these values do slow down progressively to their homeostatic levels.

Laborit and Huguenard used this method to protect patients during and after major operations (1950).

The capacity for reaction has certain limits. The organism, after an aggression, hovers around its position of primitive equilibrium. It is an oscillant reaction, postharmonically aggressive, and explains the shock and countershock phases of Selye's alarm reaction; but this movement extends itself to the catabolic and then to the anabolic phase.

Laborit theorized that a real biocatalytic balance exists around the lost equilibrium —oscillations related to calcium and potassium plasma, histamine, acetylchloline, epinephrine, glycocordicoids, minerocorticoids, etc. These elements, according to Laborit, group synergically, the adrenergic group or the colinergic group predominating at each moment, establishing periods of the oscillant postaggressive reaction. Laborit considered one phase of immediate disequilibrium: If the aggression goes beyond the threshold of reaction, the organism enters into shock. Immediate shock, with an almost complete lack of reaction of the homeostatic defense, would be rare, happening only after an aggression of great intensity or in an organism not already equilibrated. The signs of immediate shock are usually masked by a rapid adrenergic response that results in peripheral anoxia and vasoconstriction, with ephemeral conservation of the central irrigation and protection of the central nervous system, the primordial element of existence. The shock may occur when the organism gives up the fight, tired after unfruitful and difficult attempts at maintenance of homeostasis. Then, in the majority of the peripheral organs, arteriolar and meta-arteriolar vasoconstriction occurs, with opening of the arteriovenous shunt, resulting in hemostasis with counterflow in the capillary system. The increasing anoxia results in hypotonia of all the arteriocapillary system, with the serious consequence of secondary shock. In the anoxic phase the neurovegatative phenomena predominate, and in the following phase the phenomena of neuroendocrine reaction predominate, as is explained by Selye's theories (1950).

Laborit expressed the opinion that the phases of neuroendocrine reaction, initially catabolic and finally anabolic (Selye's phase of countershock), in which everything that happens adapts and benefits the organism, are a continuation of the oscillant reaction and must be moderated throughout their duration to prevent irreversible change.

In the catabolic phase the protein metabolism predominates over the adrenergic action in the spending and patt[illegible] of the molecule. This would be exactly the same as Carrel's "latent period," during which there is no healing of the wounds. In corroboration of this idea, Laborit named the anti-healing property of epinephrine and the oxisteroids.

In the anabolic stage there would still be a dangerous, though different, disequilibrium. In Laborit's opinion this phase would have a duration of ten or more days after intense surgical aggression, and at the moment of passing from one stage to another, severe accidents associated with frightening vasal predominance might occur. This theory would explain the hypotension, fainting spells, cold sweat, collapse and infarct occurring on the fourth or fifth day after the operation.

Anabolic Phase: In this phase the SRE is mobilized and inflammation and healing are favored. Histamine and acetylcholine play a fundamental role in molecular formation and recuperation. Reestablishment of the wasted molecules and tissue happens in the earlier phase, normalization of the blood protein level, restoration of intestinal mobility and of the digestive secretions, limited or stopped when anergic activity predominates. The appetite returns, the weight increases and a positive nitrogen balance is obtained. The oscillant reaction may not follow this unspecific but harmonious course, and it may appear in the catabolic phase at the adrenergic point of the oscillation. The movement then becomes inharmonious, with exaggerated catabolism. This phenomenon explains certain rapid emaciations that occur after the operation even when the patient had reacted satisfactorily to operative shock. In such cases extrarenal uremia usually follows.

In the same manner a prolonged catabolic phase, which according to Davis may last from two to five weeks, may occur. This follows insufficient anabolism, which explains postoperative evisceration, the dramatic course of some severe burns and poor consolidation of bone fractures.

Training (passive resistance after previous training) : When one subjects the organism to physical exercise constantly but not to the point of exhaustion, there will be hypertrophy of the muscular system. Thus human beings, in a general way, when subjected to progressive and constant alterations of the environment, do not react against it as in the first case, but present adrenal hyperplasia and hypertrophy in the functional and organic defense system, called the training system. Reilly observed that the light and long-lasting excitation of splanchnicectomized rabbits increases the activity of the SRE and protects the animal against inoculation with the "typhoid bacillus." So Laborit concluded that "as long as the amplitude of the oscillant postaggressive reactions is restrained by age or by lack of training to the chronic and weak aggressions of the environment, the organism would be in a state of biocatalytic odynia and suggest an oscillant therapy, with reestablishment of the natural movement of the organism, increasing to the anabolitic and catabolic oscillations."

Adaptation: The modality of response is rarely followed by the majority of the higher animals and is never observed in the human being. According to Laborit, man responds to the variations of his environment (a) by reaction to sudden aggressions of any intensity and (b) by *passive resistance after some training,* made possible by constant exposure to the aggressions of weak intensity.

One obtains adaptation only by therapeutic means requiring principally interior superiority. Both the true hibernation of the hibernates and the artificial hibernation of man are adaptations.

The classic therapy favors the reaction of defense that occurs in the attacked organism and so, disequilibrated, does nothing more than take the disequilibrium to the opposite phase. When the reactionary possibilities of the organism are on the side of the intensity of the aggression, such therapy finally will lead to exhaustion and thence to irreversible disequilibrium. In medicine one inaugurates a new modality of observation and experimentation which, defying all physiopathologic data, and underestimating the evolutionary progress of humanity, opens an unlimited field of research and therapy. Discussing the indications for this type of therapy, Laborit stated: "Every time that the organism presents itself with its means of homeostatic regulation spread by the intensity or duration of any toxic, infectious or other type of aggression, instead of allowing him to exhaust himself in useless efforts, it would be interesting to keep him in moderated life."

REPORT OF A CASE

On March 6, 1955, A. A. C., a Brazilian student aged 17, jumped from a springboard into a swimming pool in shallow water, striking his head hard against the bottom. He felt dizzy and soon afterward noted that his legs were paralyzed. Removed to Sao Paulo, he was put into extension by means of cervical traction but was unable to tolerate it because of the pain.

When the youth was first seen in conference, examination showed him to be in good general condition. There was flaccid paraplegia at the sixth cervical level, with no reflexes, not even the Babinski sign. There was complete paralysis of the intercostal muscles and of the cervical accessory muscle of respiration. Respiration itself was maintained exclusively by the diaphragm. Anesthesia was apparently present at approximately the third cervical level, but this was difficult to confirm.

On March 7 the patient was put into the Recuperation Center at Santa Casa de Sao Paulo and was referred to one of us (F. S.) for artificial hibernation. The tentative diagnosis was section of the spinal cord, possibly with edema of the cord as well.

On March 8 the patient was restless and feverish (temperature 37.8 C.), with abundant tracheobronchial secretion. Examination revealed the conditions observed on March 7, aggravated by flatulent intestinal distention and retention of urine. Dr. Patrick insisted on cervical traction, beginning with 8 Kg. and progressing to 16 Kg.

On March 9, breathing was maintained exclusively by the diaphragm, the intercostal muscles being paralyzed and the cervical muscles practically functionless, owing to the cervical traction. The respiratory rhythm was approximately of the Kussmaul type. The breath was cetonemic. The intestinal meteorism and the retention of urine were treated by intestinal and vesical catheterization. There was total superficial and profound arreflexia of the trunk and legs.

On March 10 the patient had a bad night, his condition being progressively aggravated. His breathing was very poor and the tracheobronchial secretions reduced. Traction was lowered, and cutaneous excoriation of the chin was observed. The excessive urine was eliminated; the hyperdistended bladder contained 300 cc. of concentrated bloody urine. The temperature rose to 39.8 C. in spite of the profound hibernation and cooling.

On March 11, the administration of oxygen by catheter was replaced by the use of a refrigerated oxygen tent. Marked edema of the neck was observed. The intercostal muscles were still paralyzed, but the respiratory rhythm was better and the diaphragmatic movements wider as a result of the relief of intestinal meteorism and vesical distention and of freeing the cervical muscles from traction.

At noon on March 12 the patient died. Permission for necropsy was not granted.

COMMENT

Artificial hibernation was employed in this case to prolong, to the utmost possible extent, the life of a patient who had probably sustained a high section of the spinal cord, with hematomyelia. The basis for this therapy was protection of the patient, by weakening his nervous system to the "crepuscular" state, against pain and against fear of the imminence of death. It was also considered that, if cervical traction and routine management of the fracture or fractures proved necessary, hibernation would be helpful.

Artificial hibernation was also helpful in (a) reduction and even elimination of traumatic edema of the neuro-axle; (b) moderation of the oscillant postaggressive reaction, preventing marked adrenergic or colinergic oscillation; (c) reduction of the metabolic needs; (d) diminution of bronchial secretions, with avoidance of obstruction to pulmonary breathing; (e) prevention of marked dehydration, with diminution of the loss of liquids by the skin and kidneys; (f) creation of an obstacle to germ growth, since such therapy makes this development difficult and because, during hibernation, there is marked leukocytosis; (g) production of good visceral prophylaxis against thrombosis in the interior paralyzed members; (h) production of good visceral vascular dilatation, especially in the renal, cerebral and coronary areas, through the use of phenotiazine derivatives; (i) diminution of cardiac irritability, preventing dysrhythmia, through the use of procaine hydrochloride, and (j) prevention of shock.

Technic and Course of Hibernation Employed. — Hibernation in this case was started at noon on March 7, 1955, with the lytic mixture (M_1) in 500 mg. of glycophysiologic solution. The Laborit-Huguenard technic was used, in "cocktails" uninterruptedly employed, with No. 1 predominating. The other cocktail consisted of antibiotics in fractional rations; penicillin, 100.000 units every three hours; streptomycin, 25 mg. every twelve hours; barbiturates in small, frequent sedative doses, and hypnotic medication. Novalgina was given as needed for high temperature. Physiostigmine in small doses was used to counteract the marked neuroplegic action of the lytics.

On March 7 the patient's biologic values underwent frequent alterations. The systolic block pressure varied from 12 to 10 and the diastolic from 7 to 6; the temperature ranged from 37 to 38 C., rising to 38.5 C. in the early morning. The respiratory rate varied from 24 to 30. The volume of urine was 900 cc. The urine contained sugar (125 mg. per hundred cubic centimeters), and the carbon dioxide combining power was 50 volumes per cent.

Cervical traction of 8 Kg. was applied. The breathing was exclusively diaphragmatic. The cutaneous capillary circulation was good.

On March 8, therapy was administered as aforedescribed. Dextrose (50 per cent) was given in small repeated doses. The temperature declined. An icebag was applied to the axilla, to the groin and later to the precordial region. The blood pressure varied from 12 systolic and 7 diastolic to 12 systolic and 8 diastolic. The pulse rate was 100, falling to 92 at night. The volume of catheterized bloody urine was 1,100 cc.

The intestines were paralyzed. An enema was given, with practically no effect. The value for urea was 45 gm. A gastric tube was employed for alimentation, and a liquid hyperprotein diet was given every three hours. The patient was in profound hypnosis, with a slight crisis manifested by agitation of the arms. The circulation was good, with no sign of cyanosis. The neurologic picture was unaltered.

On March 9 the blood pressure was within normal limits. The pulse rate varied from 84 to 90. The bladder was neurogenic, and catheterization produced 1,020 cc. of frankly bloody urine. An enema had no effect. The carbon dioxide combining power was 55 per cent; the value for urea, 75 mg. A liquid hyperprotein diet was given every three hours. The rectal temperature fell to 36 C. with refrigeration. In the afternoon it rose to 37 C. and at night to 38.8 C. Novalgina was administered several times, intravenously and intramuscularly. Dextrose, 50 per cent, was given in small repeated doses. The value for urea was 105 mg. and that for blood sugar 135 mg. The carbon dioxide combining power was 40 volumes per cent. The acidosis was corrected with M/6 sodium lactate. A blood count revealed 5,000,000 erythrocytes per cubic millimeter, with 14 mg. of hemoglobin, and 10,800 leukocytes per cubic millimeter, with 2 per cent eosinophils.

On March 10 the temperature at 4 a.m. was 40 C., with variations from 38 to 70 C, in the afternoon. Novalgina was given intramuscularly several times, and the oxygen tent was refrigerated at 18 C. The blood pressure was within normal limits. The pulse rate was 84 to 88. The capillary circulation was good, and there was no cyanosis. The neurologic picture was unchanged. The patient was in profound sleep. The diaphragmatic breathing rate was 35. There was edema in the cervical region, with extension to the auricular and occipital areas, involving the scalp. Trophic lesions were observed on the heels and in the sacral region. There was a sore in the medial area of the chin, at the point of support for the cervical traction apparatus. The cervical traction was withdrawn.

On March 11 the temperature was falling (36 to 35 C.). The blood pressure was within normal limits (11 systolic and 8 diastolic). The respiratory rate was 35 and the carbon dioxide combining power 40 volumes per cent. Acidosis was corrected with M/6 lactate. Hyperpnea (35 respirations per forty minutes) was present. The neurologic picture and the cervical edema were unaltered.

On March 12 there was great variation in the blood pressure, even with the lytic cocktail therapy. At 2 p.m. the pressure was 18 systolic and 9 diastolic; at 2:30 p.m., 19 systolic and 11 diastolic. A cyanotic crisis occurred, with Küssmaul breathing. At 3 p.m. the pulse was thready, with 140 beats per minute. The pupils were dilated; the blood pressure was highly oscillatory; Cheyne-Stokes breathing was present. The capillary circulation was poor, and there was cyanosis of the extremities. Artificial respiration with the Taksoka apparatus was given from 3 to 6 p.m. The diaphragmatic contractions were not sufficient to expand the thorax. Out of the resuscitator, the patient again showed Cheyne-Stokes respiration and dilation of the pupils. He died at 6 p.m.

SUMMARY

The author discusses Laborit's technic of artificial hibernation and suggests that, although this method has opened an immense field of research in physiopathology, further investigation and technical improvements should be made. A clinical case is reported in detail.

ZUSAMMENFASSUNG

Der Verfasser erörtert Laborits Technik des künstlichen Winterschlafes und vertritt die Ansicht, dass, obgleich das Verfahren ein unermessliches Gebiet für die Forschung in der Physiopathologie eröffnet hat, weitere Untersuchungen und technische Verbesserungen wünschenswert sind. Über einen klinischen Fall wird ausführlich berichtet.

SUMARIO

O autor discute a técnica de Laborit de hibernação artificial e sugere que, embora êste método tenha aberto um imenso campo de pesquisa na fisiopatologia, investigações posteriores e aperfeiçoamentos técnicos devem ser feitos. Um caso clínico é comunicado em detalhe.

RÉSUMÉ

L'auteur discute la techniq
d'hibernation artificielle et

que, malgré la méthode a ouvert un champs immense de recherche physiopathologique, il faudra continuer des investigations et des perfectionnements mécaniques. Un cas clinique est reporté en détail.

RESUMEN

El autor comenta la técnica de hibernación artificial de Laborit y concluye que, aún cuando este metodo ha abierto campo immenso a la investigación en fisiopatologis, deba mejorarse technimente. Se comunica un caso clínico en detalle.

RIASSUNTO

L'autore discute la tecnica di Laboritt dell'ibernazione artificiale e propone nuove ricerche e miglioramenti tecnici, benchè questo metodo abbia già aperto un immenso campo della fisiopatologia. Viene riferito in dettaglio un caso.

◆

It was not until the latter part of the 18th century . . . that a medical journal. which foreshadowed the development of general medical journals today, was published in England. The first medical journal to become firmly established was the *Medical and Physical Journal of London*. 1799. later edited by Dr. Roderick Macleod, a brilliant scholar. This journal professed to give its readers the most recent information about medicine, surgery, pharmacy, chemistry and natural history. The journal and the *Medical and Chirurgical Review* (1794) were in fact the only two journals of any importance until Thomas Wakely founded *The Lancet* in 1823. *The Lancet* opened a new era. Earlier medical journals had as their stated purpose the diffusion of medical knowledge. This was also the purpose of *The Lancet*, but it also endeavored to make itself the organ of the medical profession by indicating in its columns the direction in which reforms were needed to improve the education and training of physicians, and to maintain proper standards for the profession. The editor was keenly aware of the abuses and injustices then prevailing, and eagerly took upon his shoulders the task of elevating standards of education and the correction of many abuses then apparent. In 1844 the pages of *The Lancet* were enlarged, and in the choice and arrangement of material it became almost the standard pattern of weekly medical journals throughout the British Empire, and even, to a lesser degree, America.

Local medical journals were neither numerous nor successful in towns of England. As early as 1830 attempts were made to start them, but it was not until the latter half of the 19th century that such journals were successfully published for any length of time. Local journals are important in that they stimulate the recording of material which might otherwise be lost, preserve the memories and work of men who have practised in those places, and also serve as an index to the activities of the medical men in the district.

—*Postell*

Jejunostomy

JOAO DE RESENDE ALVES, M.D., F.I.C.S.*

BELO HORIZONTE, BRAZIL

THERE are still many occasions on which surgeons can perform jejunostomy in order to feed their patients. It may be permanent, when there is no possibility of performing another operation that repairs the normal continuity of the digestive tract, or it may be temporary, when the operation is performed only in order to nourish the patient (a) until the main operation can be performed, (b) to protect a suture placed above the passage of food (anastomosis of the esophagus with stomach or intestine) or (c) to facilitate the healing of a fistula.

Jejunostomy is recommended for the following conditions:

1. Inoperable cancer of the stomach.
2. Acute inflammation or acute caustic lesions of the stomach.
3. Chronic retraction of the stomach making gastrostomy impossible.
4. Obstructive lesions of the esophagus, when the stomach is to be brought up for an intrathoracic anastomosis.
5. Duodenal fistula, postgastroduodenectomy or other operation performed on the duodenum.
6. To protecting anastomosis after esophagectomies, making possible an immediate feeding.
7. Fistula after esophagoesophageal anastomosis.
8. Peptic ulcer in exceptional cases, for patients who cannot bear a major operation because of their bad nutritional state and miopragy of vital organs.

A person can be nourished by mouth or by rectum, by parenteral means or by an indwelling tube in the stomach, duodenum or jejunum, and also by a gastrostomy or jejunostomy; the oral way is the normal one, and the other means of nourishment are used temporarily for sustaining the organism. The higher the intake of food, the better is its digestion; introduction of food into the stomach, therefore, is preferable whenever it is possible.

Clarke, in 1949, stated: "With our present-day facilities it is next to impossible to satisfy basic nutritional requirements by parenteral means alone." This is true and will always be true; and, though the food were sufficient for all organic necessities, the patient would not be able to bear its continuous introduction; its benefit when given rectally is not sufficient and frequently provokes diarrhea, which leads to starvation.

The use of the duodenum would be better than that of the jejunum, because the food would be in immediate contact with the digestive juices, but the anatomic structure of the duodenum makes more difficult the creation of the fistula and the loss of duodenal juices would be bad for the patient. Yet jejunostomy must be performed as a means of nourishing patients.

There are two important problems in jejunostomy, having to do with (1) the technic and (2) the kind of food to be given. With regard to technic, one must consider the position of the fistula on the jejunum. The jejunostomy must remain on the highest part of the jejunum, where food is more easily digested and absorbed. There are, however, difficulties: (a) the approach to the highest part of the jejunum and (b) identification of the fixed l

---

*Professor of Surgery, School of Medicine, University of Minas Gerais, Belo Horizonte, Brazil.

Submitted for publication Oct. 29, 1955.

and of the efferent loop where the fistula will be placed, through a small abdominal incision.

I solved the problem of approach by making a transverse and supraumbilical incision, on the left side of the abdominal wall, two-thirds of the way down on the external edge of the left rectus abdominis muscle. After the opening of the peritoneum, the right forefinger is inserted into the abdominal cavity to perform the Wölfler-Socin maneuver. In this way, the loop one gets hold of is a jejunal one. If there is any doubt, the method of Monk* should be used. This will facilitate identification of the intestinal segment and its direction if one notes the largeness of the loop and the thickness of its wall, the disposition and caliber of the mesenteric vessels and the quantity and appearance of the mesenteric fat.

The size of the fistula to be created must also be considered. Jejunostomy must permit the passage of a tube of large caliber, through which the food can be introduced without obstruction. The jejunostomy may take the whole bore of the jejunum, as in Maydl's method.

The next consideration is continence. This is the greatest problem with all orifices created for nourishment. Escape of enteric juices through a jejunostomy causes heavy damage to the patient, because of eczema with acute pain; and when the escape is copious the patient becomes weaker and weaker. Consequently, several methods and many modifications of them have been introduced to enable surgeons to avoid such troubles.

Surmay was the first to perform a jejunostomy. The method was a very simple one. It consisted in the fixture of the jejunum on the abdominal wall, with a lateral opening. It was bad, because there was stasis in the afferent loop due to the kink in the loop, and there was also quite a copious escape of the jejunal contents. In Maydl's method the jejunum is severed and the afferent loop anastomosed on the efferent one, 10 to 15 cm. from the jejunal opening that remains on the skin.

I made 2 such experiments, which were not successful, because escape of fluid through jejunostomy was strong, though there was no stasis of the afferent loop.

The Albert-May-Robson method consists of laterolateral anastomosis of the afferent and efferent loops, with a simple opening on the top of the folding loop. It prevents the stasis on the afferent loop, but not the escape of the intestinal contents

Karewsky, in 1896, used Witzel's method of jejunostomy, and it has been widely used. I have often performed it, but it has also many disadvantages:

1. It permits the seepage of intestinal contents around the tube, which becomes worse after some days.
2. Decreasing of the bore of the efferent loop increases stasis in the afferent one.
3. Obstruction due to coiling of the loop or thickness of the tube may occur, obliterating the intestinal bore.
4. A thin tube must be used, the inconvenience of obtaining which is frequently a hindrance.
5. When obstruction occurs and a change of tubes is necessary, this becomes rather difficult.
6. If leakage at the suture occurs, there will be peritonitis. Barber** advised the Stamm-Kader method, using muscleperitoneal graft, with the help of epiploön too. Even so, there were complications.

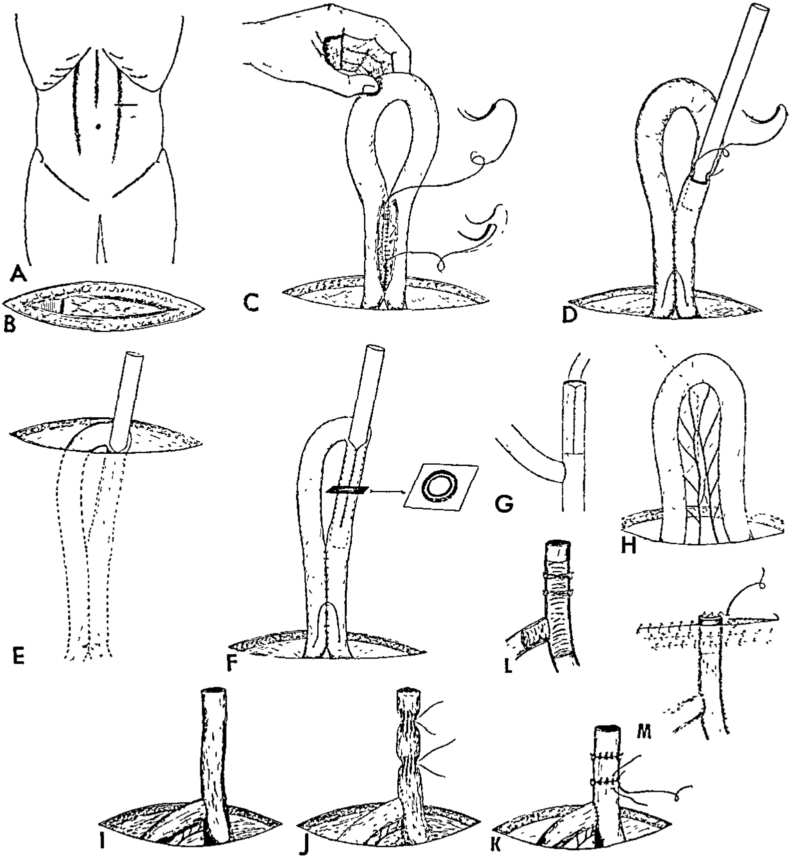
Several methods used for gastrostomy, such as Spivack's, Depage's and Janeway's, have been used for jejunostomy.

To prevent intestinal stasis, angulations or obstructions and to obtain a continent jejunostomy that permits the passage of a thick tube, I propose the following technic,

---

*See bibliography: Horsley and Bigger, *Operative Surgery*.

**See bibliography.



Operative technic (see text).

which is further explained by the accompanying illustration.

Method 1 (*A, B, C, D, E* and *F*) is as follows: 1. A transverse incision 6 to 8 cm. long is made 2 cm. above the rectus abdominis muscle (*A*). The approach is made according to the description already given (*B*). Next, the fixed jejunal loop is located and identified and its direction determined. A laterolateral anastomosis is made 10 cm. from the top of the coiling loop (*C*) ; on the efferent loop an incision 3 cm. long is made above the anastomotic suture. *A tube is introduced into the in-*

testinal lumen through the incision to a point a little above the anastomotic opening, so as not to disturb its function (*D*). Over the tube a seromuscular suture is placed as in Witzel's technic (*E*). The tube remains adherent to the wall of the seromuscular passage created on the jejunal efferent loop and thus prevents any leakage of contents from the afferent loop (*F*).

I have performed this operation with good results, but it has some inconveniences, as I have explained. Continuing my study of the problem, I have found two other solutions.

Method 2 (*G*) is a combination of Maydl's method and Witzel's. The end of the efferent jejunal segment is sutured, and on its wall a Witzel anastomosis is made.

When Methods 1 and 2 are used, the jejunostomy opening cannot be made upon the skin, because the serosa does not resist the exposure, and consequently there will be ulceration and fistula. This happened to 1 patient.

If the loop is in the peritoneal cavity and protected by the abdominal wall, there are the following difficulties with Witzel's variation: (a) slackening of continence with use; (b) difficulty in introducing the tube, should it happen to come out, and (c) leakage and peritonitis.

I found the solution in Method 3, which I consider the best for the following reasons:

1. There is no danger of coiling or leakage.
2. It provides excellent continence.
3. Through the jejunostomy opening a thick tube can be introduced.
4. The tube may be changed easily.
5. The tube will be used only during the introduction of food.
6. There is no problem concerning obstruction of tube.
7. The jejunostomy may be permanent, because the fistula is labial.
8. If it is temporary, its closing is very easy.

The procedure in Method 3 (*H, I, J, K, L* and *M*) is as follows: A Maydl operation is performed. On the efferent segment, above the anastomosis, two valves are created as in a Glassmann gastrostomy. The jejunal loop is taken out and severed (*H*). A terminolateral anastomosis is made between the afferent and efferent loops (*I*). The valves are created (*J* and *K*). A section showing these valves is depicted in *L* and the completed operation in *M*.

Two patients were operated on by this method. In the first case, catgut was used in creation of the valves. The continence was not good, because the catgut slackened before completion of the healing of the seromuscular suture that buried the valves. In the second case cotton thread was used, with excellent results.

SUMMARY

The author presents a new technic for performing jejunostomy, which, in his opinion, has the following advantages:

1. It eliminates stasis in the afferent loop.
2. It prevents kinking of the loops.
3. It results in perfect continence.
4. It permits the introduction of a thicker tube than is ordinarily employed.
5. Its closure, if necessary, is easy.

RÉSUMÉ

L'auteur presente une nouvelle technique pour la jéjunostomie, qui, dans son opinion, présente les avantages suivants:

1. Elle évite la stase dans le lacet afférent.
2. Elle évite l'occlusion des lacets.
3. Elle résulte en continence parfaite.
4. Elle permet l'introduction d'un tube

plus gros que celui qui est employé en général.

5. La fermeture, si nécessaire, est facile.

ZUSAMMENFASSUNG

Der Verfasser berichtet über eine neue Technik der Ausführung der Jejunostomie, die nach seiner Meinung folgende Vorteile bietet:

1. Sie schliesst eine Stase in der zuführenden Schlinge aus.
2. Sie vermeidet eine Abknickung der Darmschlingen.
3. Sie führt zu völliger Kontrollierung der Darmentleerung.
4. Sie gestattet die Einführung von dickeren Schläuchen, als gewöhnlich zur Anwendung kommen.
5. Die Schliessung der Jejunostomie, wenn erforderlich, ist leicht auszuführen.

SUMARIO

O autor apresenta uma nova técnica para a realização da jejunostomia, que, de acôrdo com a sua opinião, possue as seguintes vantagens:

1. Elimina a estase na alça aferente.
2. Evita acotovelamento das alças.
3. Resulta em continência perfeita.
4. Permite a introdução de um tubo mais grosso do que é geralmente usado.
5. Seu fechamento, si necessário, é fácil.

RIASSUNTO

L'autore presenta una nuova tecnica di digiunostomia che, secondo lui, ha i seguenti vantaggi:

1. Elimina la stasi nell'ansa afferente.
2. Evita l'inginocchiamento dell'ansa.
3. E' perfettamente continente.
4. Permette l'introduzione di un tubo più grosso di quello solito.
5. La sua chiusura, se necessaria, è facile.

RESUMEN

El autor presenta una nueva técnica de yeyunostomía que según él tiene las siguientes ventajas:

1. Elimina la estasis del asa aferente.
2. Evita el acodamiento de las asas.
3. Produce una continencia perfecta.
4. Permite la introducción de un tubo más grueso al que se usa habitualmente.
5. En caso necesario, el cierre se hace facilmente.

BIBLIOGRAPHY

Barber, W. H.: Jejunostomy, Ann. Surg. 97: 553-576 (April) 1953.

Clute, H. M. S., and Bell, L. M.: Jejunostomy for Postoperative Feeding, Ann. Surg. 114:462-471 (Sept.) 1941.

Clark, T. C.: Observations on Jejunal Alimentation, Surgery 26:364-373 (Sept.) 1949.

Delrez, L.: Procédé de Jejunostomie, Presse méd. 53:1063-1064 (July 15) 1933.

Horsley, J. S., and Bigger, I. A.: Operative Surgery. St. Louis: The C. V. Mosby Company, 1940, vol. 2.

Monteiro, A.: Duas Grandes Intervenções: Jejunostomia e Ileostomia, Rev. Brasil Cir. 19:229-234 (March) 1950.

Monod, C. G., et Vanverts, J.: Traite de Technique Opératoire. 1908, Vol. 2.

Rudo, S. F.: A Stainless Steel Cannula for the Creation of Gastrointestinal Fistulas, Surgery 35: 844-847 (June) 1945.

Spivack, J. L.: The Surgical Technic of Abdominal Operations. Springfield, Ill.: Charles C Thomas, Publisher, 1946.

Scott, H. G., and Andrew, C. J.: Jejunal Alimentation, Ann. Surg. 93:1197-1201, 1931.

Steward, J. D.: Management of Protein Deficiency in Surgical Patients, J.A.M.A. 136:1017-1021 (April 17) 1948.

Thorek, M.: Modern Surgical Technic. Philadelphia: The J. B. Lippincott Company, 1939, vol. 3.

Wolfer, J. A.: Jejunostomy with Jejunal Alimentation, Ann. Surg. 101:708-725 (Feb.) 1935.

Leiomyosarcoma of the Jejunum

Report of a Case

JOHN HARRINGTON TANOUS, M.D., F.I.C.S.*
AND
IRA JAY LIEN, M.D.**
MIAMI BEACH, FLORIDA

LEIOMYOSARCOMA of the jejunum is a relatively rare pathologic entity. A review of the literature reveals approximately 16 previously reported cases.[1]

The lesions apparently exhibit a characteristic clinical picture easily confused with that of bleeding peptic ulcer or intestinal obstruction, and for this reason the diagnosis is seldom made prior to surgical intervention.

Owing to the difficulty of preoperative diagnosis, the importance of thorough investigation of the small bowel should be emphasized when an exploratory laparotomy is performed for gastrointestinal hemorrhage and the stomach and duodenum are observed to be within normal limits.

The average age incidence of the lesion at the time of its detection is approximately 47 years. No predilection as to sex has been recorded in the literature. A few cases have been reported in which the patients were children.[2] No instance of the congenital occurrence of the lesion has ever been substantiated. Smooth muscle tumors of the bowel exhibit a relatively low grade of malignancy. Metastatic involvement is relatively uncommon.

Metastases, when they do occur, are usually blood-borne and are observed in the lungs, liver, brain and bones.

These tumors, which arise from the smooth muscle of the intestinal wall, may be sequelae to benign myomas that have existed over a long period. Microscopically, they are composed of spindle-shaped cells in an interlaced pattern, with large vesicular nuclei and an abundance of fibrillar stoma. They are not encapsulated, and they invade normal adjacent muscle in finger-like projections.

Golden and Stout[3] stressed the importance of mitosis as a criterion of malignancy, adding, "If two or more mitoses per high power field are present one can feel fairly sure in predicting malignancy." Pathognomonic myofibrillae can usually be detected by special staining.

REPORT OF CASE

A well developed and well nourished white man 42 years old was admitted to St. Francis Hospital on Jan. 7, 1955, to the service of Dr. Seymour Alterman, complaining chiefly of weakness, vertigo, dyspepsia, tarry stools, abdominal discomfort and nausea. There was no history of vomiting or of frank rectal bleeding.

The patient had had similar episodes for ten years, with seven severe exacerbations requiring hospitalization. Repeated roentgen studies of the gastrointestinal tract, taken at three different hospitals in three different sections of the United States, revealed an active duodenal ulcer, which was considered the source of the gastrointestinal bleeding. The patient was treated with multiple blood transfusions, antispasmodics and Muhlengracht and Andreesen diets. He recovered on each occasion.

At the age of 8 years, operation had been

---

*Chief, Department of Surgery, St. Francis Hospital, Miami Beach; Associate Attending Surgeon, Jackson Memorial Hospital, and Clinical Instructor, University of Miami Medical School, Miami.

**Senior Resident in Surgery, St. Francis Hospital, Miami Beach.

Submitted for publication Nov. 11, 1955.

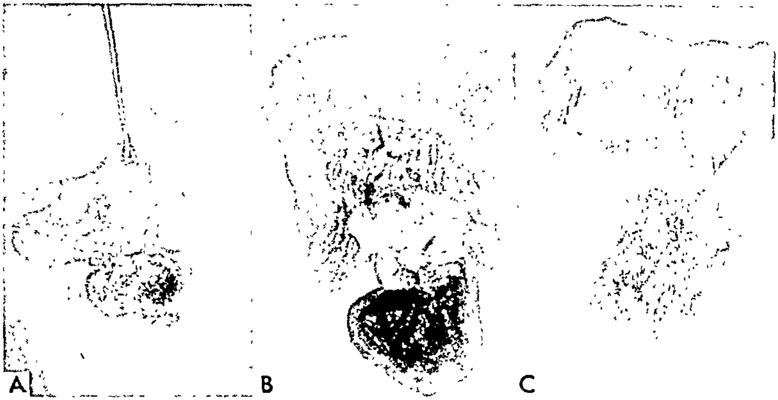


Fig. 1.—*A*, submucosal leiomyosarcoma of jejunum in its relation to normal portions of the organ. *B*, jejunum opened and tumor exposed, showing ulceration and projection into lumen. *C*, resected tumor. Note smooth, glistening, cystic and hemorrhagic lobulations.

performed for a ruptured appendix. The remainder of his history was not contributory to the present illness.

The erythrocyte count was 2,750,000 per cubic millimeter blood, with 8.3 Gm. of hemoglobin; the leukocyte count, 6,750, with a differential count of 61 per cent segmental cells, 3 per cent stab cells, 1 per cent eosinophils, 1 per cent monocytes and 30 per cent lymphocytes. The urine was normal. The stools gave a 4 plus reaction for occult blood. The value for total serum protein was 5.45 mg.; for albumin, 3.81 mg., and for globulin 1.64 mg. per hundred cubic centimeters. The albumin-globulin ratio was 3.31:1. The value for nonprotein nitrogen was 18 mg., and for urea nitrogen 18 mg. per hundred cubic centimeters. The value for blood chlorides was 504 mg. per hundred cubic centimeters, or 86.18 milliequivalents; for sodium, 320 mg., or 142 milliequivalents, and for potassium, 15.2 mg., or 3.85 milliequivalents. The blood pressure in millimeters of mercury was 120 systolic and 60 diastolic.

During the first twenty-four hours after admission the patient was given a total of 1,500 cc. of whole blood. An erythrocyte count on Jan. 18, 1955, revealed 3,090,000 red blood cells per cubic millimeter, with 10 Gm. of hemoglobin. The patient was then seen in consultation with the surgeon (J. H. T.). A Levine tube was inserted, with continuous Wangensteen suction. An additional transfusion of 1,000 cc. of whole blood was given during the following twenty-four hours, and the erythrocyte count rose to 3,800,000 per cubic millimeter, with 10.5 Gm. of hemoglobin. Another transfusion of 1,000 cc. of whole blood during the next twenty-four hours brought the eryth-

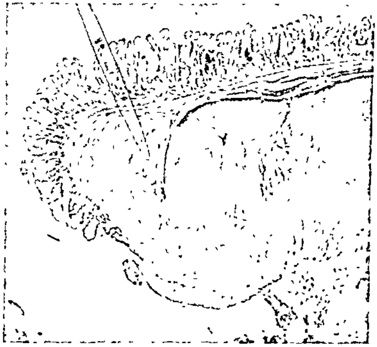


Fig. 2.—Microscopic section × 10. Note mucosal ulceration.

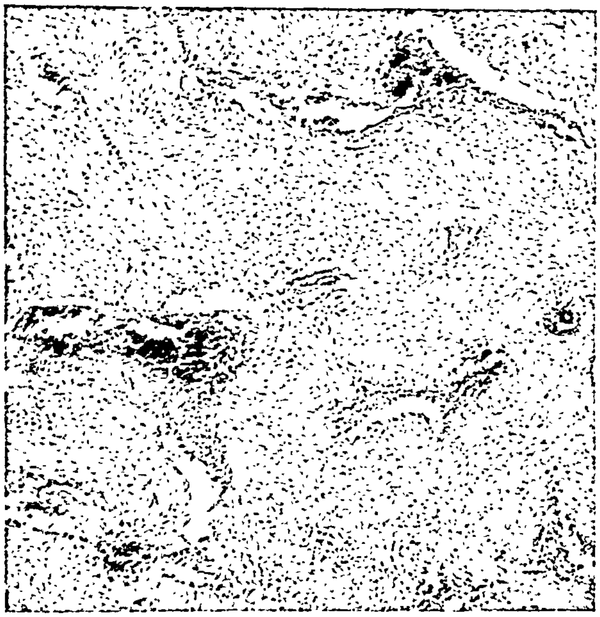


Fig. 3.—Microscopic section × 56. Note vascular and hemorrhagic spaces.

rocyte count to 4,030,000 per cubic millimeter, with 12.4 Gm. of hemoglobin. The stools continued to be tarry, and the patient was taken to the operating room on January 20.

An upper left paramedian incision was made; the left rectus mucle was retracted laterally, and the posterior rectus sheath and peritoneum were opened. A tremendous number of adhesions was noted throughout the upper and lower right quadrants of the abdomen. The gallbladder was adherent to the duodenum.

The adhesions were freed by sharp and blunt dissection. Examination of the stomach and duodenum failed to reveal any gross pathologic change, either on visual examination or on palpation.

Since there was clinical evidence of gastrointestinal bleeding, it was decided to explore the entire small and large bowel.

A tumor mass measuring 6.5 by 3.8 by 4 cm. was noted approximately 48 inches (119.3 cm.) distal to the ligament of Treitz (Fig. 1*A*). It appeared smooth, glistening, cystic, hemorrhagic and lobulated (Fig. 1*B*).

Peyr clamps were placed 6 inches (15 cm.) proximal and distal to the tumor. The mass was resected and a two-layer end-to-end anastomosis was performed.

The remainder of the small and large bowel appeared to be normal, and no evidence of metastasis to the liver or adjacent organs was noted.

In view of the positive results of three roentgen studies revealing duodenal ulcer and in consideration of the seven attacks of gastrointestinal bleeding, a gastrotomy was deemed advisable. A 1½-inch (3.7 cm.) incision was made adjacent to the pyloric ring and along the horizontal axis of the stomach. Examination of the gastric and duodenal mucosa, visually and by palpation, revealed no pathologic change. The gastrotomy was then closed in two layers.

The abdominal wound was also closed in layers. The patient left the operating room in good condition. He was given 1,000 cc. of whole blood during the operation.

On section, the tumor was revealed as a hemorrhagic unilocular mass filled with partially clotted dark blood. The hemorrhagic cyst formed its external portion, measuring 3.5 by 2.6 by 1.4 cm. This was soft, gray and projected into the lumen of the jejunum in the form of a mushroom flattened on both sides.

The mucosal surface of the tumor was ulcerated. Although the tumor projected into the lumen, it did not produce any obstruction (Fig. 3*C*).

Microscopic examination conformed to Golden and Stout's criteria, showing interlacing bundles of smooth cells and mitoses (Fig. 2).

Routine postoperative measures, including Wangensteen suction and the administration of parenteral fluids and antibiotics, were instituted, and an uneventful convalescence ensued. A minimal amount of atelectasis of the left costophrenic region developed but this responded to medical therapy.

SUMMARY

The case of a 42-year-old white man with a ten-year history of repeated attacks of gastrointestinal bleeding, manifested by tarry stools, weakness and dyspepsia and diagnosed medically and roentgenographically as bleeding peptic ulcer, is reported.

At operation a leiomyosarcoma of the jejunum was located approximately 48 inches (119.3 cm.) distal to the ligament of Treitz. Primary resection of the jejunum and gastrotomy were performed.

In view of the low grade of malignancy

associated with this type of tumor in the absence of metastasis, the prognosis is good.

The small intestine should be investigated in all cases of gastrointestinal bleeding characterized by bizarre symptoms with no apparent cause referable to the stomach or the duodenum.

RIASSUNTO

Viene riportato il caso di un uomo di 42 anni, di razza bianca, con una storia di 10 anni di ripetuti attacchi di emorragie gastro-intestinali, manifestatasi con feci nerastre, debolezza e dispepsia e diagnosticata sia clinicamente che radiologicamente come un ulcera peptica sanguinante. All' intervento si rivelò un leiomiosarcoma del digiuno localizzato a circa 48 pollici (119,3 cm.) dal ligamento di Treitz. Si procedette ad una resezione primaria del digiuno ed alla gastrotomia. Data la scarsa malignità di questo tumore e l'assenza di metastasi, la prognosi è buona. Bisognerebbe sempre studiare attentamente il tenue in tutti i quei casi di emorragie intestinali caratterizzati da sintomi strani e in cui non vi siano apparentemente compromissioni dello stomaco e del duodeno.

ZUSAMMENFASSUNG

Es wird über den Fall eines 42-jährigen Mannes der weissen Rasse berichtet, der eine zehnjährige Krankheitsgeschichte mit wiederholten Anfällen von Magendarmblutungen aufwies, die mit teerfarbenen Stühlen, Schwäche und dyspeptischen Beschwerden einhergingen und medizinisch und röntgenologisch als blutendes Magengeschwür diagnostiziert worden waren.

Bei der Operation fand sich ein Leiomyosarkom des Jejunums etwa 119cm distal vom Treitzschen Ligament. Es wurden eine primäre Resektion des Jejunums und eine Gastrotomie vorgenommen.

Die Prognose ist dank der dieser Geschwulst eigenen geringen Malignität und des Fehlens von Metastasen günstig.

In allen Fällen von mit uncharakteristischen Symptomen einhergehenden Magendarmblutungen, die sich nicht ohne Weiteres auf eine Erkrankung des Magens oder Zwölffingerdarms zurückführen lassen, sollte eine Untersuchung des Dünndarms erfolgen.

SUMARIO

É relatado um caso de um homem branco de 42 anos de idade com uma historia de 10 anos de crises repetidas de hemorragia gastroentestinal, manifestado por melena, enfraquecimento e dispepsia, cujo diagnóstico clinico e radiologico ere de ulcera peptica hemorragica. Na operação um leiomiosarcoma do jejunum foi localizado aproximadamente 119.3 cm. do ligamento de Treitz. Ressecção primaria do jejunum e gastrotomia foram efeituadas. Em vista do baixo grau de malignidade associada a este tipo de tumor e na ausencia de metasteses, o prognóstico é bom. O intestino delgado deveria ser investigado em todos os casos de hemorragia gastroentestinal caracterizada por sintomas leves com nenhuma causa aparente relacionada ao estomago ou duodeno.

RÉSUMÉ

L'auteur reporte le cas d'un homme blanc, age de 42 ans qui pendant 10 ans avait plusieurs attaques d'hémorrhagie intestinale, manifestées par des selles noires, faiblesse et dyspepsie, et dont le diagnostic d'ulcère peptique, saignant était fait par l'examen clinique et radiographique.

A l'opération on trouva un leiomyosarcome du jéjunum, situé à peu près 119,3 cm. distal du ligament de Treitz. Une résection primaire du jéjunum et une gastrotomie furent exécutées.

Il faut explorer l'intestin grêle dans touts les cas d'hémorrhagie intestinale, charactérisées par des symptômes bizarres, si la source n'est trouvée dans l'estomac et le duodénum.

A l'égard du degrée bas de malignité associé à ce type de tumeur, en absence de metastases, le pronostic est bon.

REFERENCES

1. Smith, R. S.: Leiomyosarcoma of the Jejunum, Am. J. Surg. 84:492, 1952.
2. Roth, D.: Jejunal Leiomyosarcoma in a Newborn, Cancer 3:1049, 1950.
3. Golden, T., and Stout, L. P.: Smooth Muscle Tumors of the Gastrointestinal Tract and Retroperitoneal Tissues, Surg., Gynec. & Obst. 73:784, 1941.
4. Janes, J. M., and Taddeo, M. C.: Leiomyosarcoma: Seventeen-Year History Simulating Duodenal Ulcer, Ann. Surg. 136:887, 1952.

◆

In discussing changes in surgery we must beware of accepting the view that change and progress are synonymous, that what is new is better than what went before, or even necessarily good. The study of diseases, newly arrived or newly handed over to surgery, provides us with interest, but our enthusiasm should be reserved for those changes, often very simple ones, that lead us to something better. If we consider any condition now treated by surgery and ask ourselves, 'How can we improve the results we are getting to-day?' we can find two simple answers: first, by getting the disease at an earlier stage, before it has spread widely, before it has injured adjacent parts, before the patient is ill; secondly, by modifying our operation to give the best possible results. Both of these demand not genius, not brilliance or technical skill, but independent observation and constant hard work. Disease in its early days is betrayed by symptoms; signs belong to its later and less happy stages. By watching our patients carefully, by listening without prompting, by recording their story, however irrelevant it may appear at the time, and by comparing our notes with the exact knowledge brought to us later in the operating theatre, the laboratory bench, or the post-mortem room, we shall acquire a store of material from which we may be able to build new clinical pictures—pictures that we shall recognize when they come again, that may allow us to disentagle new diseases from the mixed class in which they are now hidden, and to recognize old ones at an earlier stage. I need only remind you that it was by such methods, nothing more dramatic, that Moynihan first drew the picture of duodenal ulcer, showed it to be not a rare disease but one of the commonest, and laid the foundation of a reputation that has seldom been equalled.

—*Ogilvie*

Peptic Ulcers in Africans of the French Cameroons

V. A. REIHMER, M.D., A.I.C.S.
FRENCH CAMEROONS, AFRICA

REPORTS concerning the incidence of peptic ulcer among Africans vary widely. Mattlett,[1] reporting on 2 cases of gastric ulcer observed in the Belgian Congo, stated that Dumont reported to the Medical Society of Leopoldville that gastroduodenal ulcers were totally absent among the people of central Africa. Roberts[2] reported 30 cases from Uganda, with a ratio of 2:1 between duodenal and gastric ulcers. Connell[3] reported having observed 5 cases of duodenal ulcer during thirteen years of practice in Tanganyika. In 1951, in the annual report of the Kenya Colony Medical Department,[4] 50 cases of gastric and 48 cases of duodenal ulcer were reported. Vassalo[5] reported 108 cases among Africans in Zanzibar. Sorge[6] reported 53 cases of peptic ulcer among Africans in Eritrea during a five-year period. Ferro-Luzzi[7] reported 67 cases among native Eritreans during a seven-year period.

Eagle and Gilman,[8] in reporting the incidence of peptic ulcer among South African white, Bantu and mixed populations, noted a total of 13 peptic ulcers reported in 9,472 autopsy records in the Bantu group. The ratio of male to female was 2:1.

Beyers,[9] in 1927, collected 4 cases of peptic ulcer by study of the records of 18,000 Bantu patients in Johannesburg, an incidence of 0.02 per cent.

Sturdevant and Shapiro,[10] in 1926, reported on 7,700 autopsy records at Bellevue Hospital in New York. They found 159 peptic ulcers recorded, only 2 of which were in Negroes.

Ellis,[11] in his study of peptic ulcer in Nigeria, reported 124 cases covering a six-year period. In 123 the ulcers were duodenal; in 1, gastric. His article is most thorough and presents a picture of duodenal ulcers among the Nigerians that could very well be presented as the clinical picture of duodenal ulcers among our Camerounais. For the past twenty years doctors of our Mission have been aware of the frequency of peptic ulcers among the Basa people served by this hospital. Peptic ulcers are found far less frequently among patients at hospitals serving other tribal groups. This study begins with my arrival at Sakbayeme in February 1950 and continues to July 1955, a period of four and one-half years, and is based on 319 cases of surgically confirmed peptic ulcer.

Incidence and Distribution. — Table 1 shows that there has been an increase in the number of cases each year since 1950, with the exception of 1954, when the hospital was closed several months. In 211 cases the patients were men; in 108, women, a ratio of 1.95:1. This is considerably different from Ellis' figure from Nigeria—112 cases with male patients and 14 with female, a ratio of 8:1. Aitken in Nigeria reported 48 cases, in 44 of which the patients were male and in the remaining 4 female, a ratio of 11:1.

Age Incidence.—Table 2 shows the age

From the Sakhayeme Hospital, American Presbyterian Mission, French Cameroons.

Submitted for publication Jan. 5, 1955.

TABLE 1.—*Incidence and Distribution*

		Gastric Ulcer				
Year	*Duodenal Ulcer*	*Benign*	*Malignant*	*Men*	*Women*	*Total*
1950	11	0	1	9	3	12
1951	20	1	4	18	7	25
1952	42	0	1	32	11	43
1953	132	1	2	83	52	135
1954	48	0	0	28	20	48
1955	56	0	0	41	15	56
	309	2	8	211	108	319

incidence of patients with ulcer in my own series. Ellis noted that the majority were between 30 and 40 years of age, whereas here the number is about evenly divided between those under and those over 40. The gastric ulcers all occurred in patients over 40. (It must be borne in mind when discussing the ages of Africans, especially women, that they frequently have no idea how old they are and are often older than they look.)

The tribal incidence is interesting. The non-Basa speaking groups accounted for only 29 of the total number, or 9 per cent. These groups account for a total of 8.5 per cent of the patients registering at the hospital annually. If this were an accurate gauge of the incidence in the other groups, one might conclude that the incidence of ulcer is about the same among the non-Basa as it is among the Basa. Doctors from hospitals in other areas of Cameroon, however, continue to report a low incidence of peptic ulcer. Probably the patients with complaints of pain in the upper part of the abdomen come here upon the recommendation of others who have found relief from similar pains, so that this service attracts more of these sufferers than do the other hospitals. It is certain that the patients do a great deal of "shopping around" before they arrive here with long histories of unsuccessful results from medical treatment.

Morbid Anatomic Aspects (Table 1).—There were 309 duodenal and 10 gastric ulcers. Eight of the gastric ulcers were malignant and 2 were benign. Interestingly enough, the 2 benign ulcers occurred in stomachs that presented a pathologic picture not unlike that of linitis plastica.

There was only 1 perforation in the entire series, and this accident occurred in the hospital the day before the patient was scheduled for operation. He was in very poor condition and died during the emergency procedure. This is significant, as anterior duodenal ulcers were present four times as frequently as posterior duodenal ulcers. An explanation might be the marked inflammatory reaction about the ulcers. Cartilage-like cicatricial masses up to the size of a grapefruit may be observed in the duodenum. Adhesions are massive and frequently dense. They commonly involve the liver, the gallbladder and the transverse portion of the colon. Some degree of obstruction is frequently associated with a long history of pain and may be manifested by an increased fasting stomach content. This may amount to more than 1,000 cc. Vomiting is an invariable late feature of the disease, although there is not infrequently a history of vomiting beginning early in its course. It is remarkable, in some cases in which there are huge scar masses and greatly dilated

TABLE 2.—*Age Incidence*

Age of Patient, Yr.	*No. of Cases*
10-15	10
16-20	15
21-25	17
26-30	29
31-35	17
36-40	60
41 and over	171

stomachs, that the patients survived the number of years that have passed since the onset of symptoms.

This marked fibroplastic response to the chronic inflammation of the ulcer is consistent with the similar response observed in cases of other chronic inflammatory conditions, such as pelvic inflammatory disease and the common keloid.

Clinical Picture. — In this series, 173 patients had a fairly accurate idea of the duration of their symptoms. Only 24 patients (Table 3) came for treatment within the first year of symptoms. There are many reasons for this delay. First of all, many try native remedies of all kinds for a time. Then they may go to dispensaries where treatment is free but the personnel not highly trained. Finally, they may find their way to Mission hospitals, where they pay for their medical and surgical care. Since they find the cost high, it may take them some time to accumulate the money. The surgical treatment of a duodenal ulcer costs the patient 3,500 francs CFA, or the equivalent of $20 in the United States. Many patients are unable to pay all or part of these charges and are handled as "charity cases." Recently, shorter histories are being recorded more frequently. This probably is the effect of the news of good results, but it also reflects the improved economic conditions in the area.

The presenting symptoms almost invariably include pain in the epigastrium, although the pain may be anywhere in the abdomen or the chest or the back. Posterior duodenal ulcers commonly cause pain in the back, at about the level of the eighth thoracic vertebra. The pain may be intermittent or continuous. More often than not, eating increases the pain instead of relieving it. Some say that eating a little gives partial relief but eating a great deal, in the normal manner of the Africans, increases the pain. Occasionally particular foods may be implicated, particularly the very hot peppers commonly included in the diet. At times yellow palm oil, which is a "must" in the local diet, increases the pain. Usually, however, any and all foods are alike implicated. Tenderness localized to the area over the duodenum is the almost invariable accompanying sign.

TABLE 3.—*Duration*

	Number of Patients
2 wk.-6 mo.	9
7 mo.-1 yr.	15
1-3 yr.	49
4-5 yr.	35
6-10 yr.	39
11-15 yr.	11
Over 15 yr.	15
	173

Constipation, with hard, black pebble-like stools, is the cardinal symptom, after the pain, of this disease. Vomiting, varying from occasional attacks to every time the patient eats or drinks, is the third most common symptom. Ellis[11] reported visible gastric peristalsis as very common. It is encountered here, though not as frequently as he reported, and it was seen more often among the early cases in the series than lately. With the patients coming in for help earlier in the course of the disease, greatly dilated stomachs are less common.

Gastric Analysis. — Gastric analysis (Topfer's method) is performed routinely in cases of suspected peptic ulcer. Table 4 shows the acid values in the last 47 consecutive cases in which ulcer was subsequently observed at operation, 26 cases in which, after a preoperative diagnosis of peptic ulcer, other pathologic lesions were present, and in 26 control analyses performed on the gastric contents of healthy young Africans between the ages of 18 and 24.

TABLE 4.—*Gastric Acidity: Units of Free Hydrochloric Acid in the Fasting State and One Hour After a Meal of 50 cc. of 7 Per Cent Ethyl Alcohol*

	Patient With Ulcer			*Patients Without Ulcer*			*Controls*	
	Fasting	*1 hr. pc.*		*Fasting*	*1 hr. pc.*		*Fasting*	*1 hr. pc.*
1.	86	109	1.	14	72	1.	36	5
2.	63	46	2.	19	53	2.	6	30
3.	18	69	3.	0	0	3.	44	49
4.	39	48	4.	20	0	4.	19	32
5.	0	0	5.	11	12	5.	18	38
6.	13	40	6.	0	20	6.	0	43
7.	38	54	7.	35	22	7.	19	18
8.	16	16	8.	20	20	8.	30	25
9.	54	66	9.	15	40	9.	20	28
10.	64	124	10.	20	28	10.	20	52
11.	31	43	11.	60	45	11.	0	0
12.	25	25	12.	0	0	12.	10	16
13.	46	39	13.	0	20	13.	10	64
14.	39	31	14.	70	47	14.	56	40
15.	25	45	15.	38	20	15.	20	0
16.	19	53	16.	10	0	16.	36	67
17.	420	340	17.	26	23	17.	0	33
18.	28	58	18.	0	28	18.	21	57
19.	138	49	19.	35	57	19.	14	19
20.	30	210	20.	28	91	20.	6	33
21.	18	22	21.	51	35	21.	20	22
22.	0	33	22.	0	10	22.	33	21
23.	0	27	23.	15	64	23.	0	11
24.	0	40	24.	0	0	24.	0	46
25.	32	29	25.	12	27	25.	0	15
26.	32	68	26.	0	27	26.	28	28
27.	14	25	Mean	21.5	31.2	Mean	17.9	27.7
28.	10	4	Range	0-70	0-91	Range	0-56	0-67
29.	20	32						
30.	38	34						
31.	44	64						
32.	60	26						
33.	35	32						
34.	36	77						
35.	23	15						
36.	75	119						
37.	0	38						
38.	32	41						
39.	39	48						
40.	103	96						
41.	25	33						
42.	34	84						
43.	0	0						
44.	26	65						
45.	50	52						
46.	48	35						
47.	13	40						
Mean	40.6	55.7						
Range	0-420	0-340						

After withdrawal of the fasting content, a test meal consisting of 50 cc. of 7 per cent ethyl alcohol is injected through a Levin tube. After one hour the gastric contents are again withdrawn and tests are made on the two specimens. The accompanying chart shows the maximum gastric acidity that occurred one hour after the alcohol meal in an ulcer patient.

Table 5 presents a summary of the gastric analyses shown in Table 4. It can be seen that among healthy young Africans at about the age of 20 there is a wide range of gastric acid values, 0 to 56 degrees of free hydrochloric acid in the fasting state with a mean of 17.9, and 0 to 67 degrees of free hydrochloric acid one hour after the alcohol meal with a mean of 27.7. Levinson and McFate[12] described the normal range of free hydrochloric acid in the fasting state as 5 to 20 units, with outer limits of 0 to 30 units. They considered 30 to 70 units the normal range forty-five minutes after an alcohol meal. Achlorhydria they described as a normal condition *in 4 per cent of children and 30 per cent* of adults 70 years of age. Any specimen with 40 or more units of free hydrochloric acid in the fasting state or 90 units after the alcohol meal they termed hyperchlorhydric.

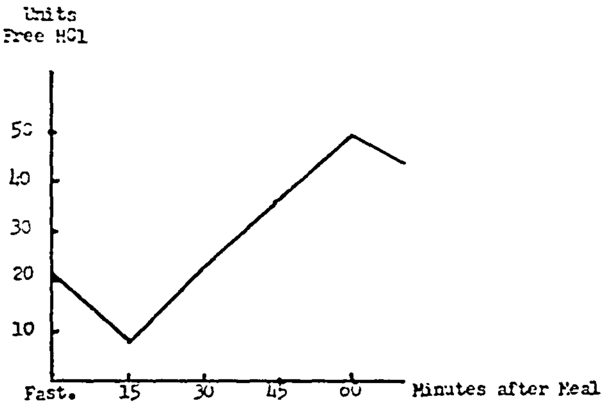
Were Levinson and McFate's values to be used as the standard for Africans, 5, or 19.2 per cent, of these healthy young controls must be considered hyperchlorhydric in the fasting state. Thus, rather than attempting to compare the gastric acidity of African patients with those of normal Caucasians, it would be better to compare them with that of healthy young Africans. Using, then, 56 units of free hydrochloric acid as the upper limit of normal in the fasting state and 67 degrees as the upper limit of normal one hour after an alcohol meal, it is observable that 8, or 17 per cent, of African patients with duodenal ulcer are hyperchlorhydric, with a mean value for free hydrochloric acid of 40.6 units, and that 2, or 7.6 per cent, were hyperchlorhydric one hour after the alcohol meal, with a mean free hydrochloric acid value of 55.7 units.

The study of those patients who were operated on with a clinical diagnosis of duodenal ulcer and discovered not to have ulcer but to have other intra-abdominal pathologic change is interesting. Both in the fasting state and after the test meal, *only 1, or 3.8 per cent, was hyperchlorhydric.* The mean free hydrochloric acid value in the fasting state was 21.5 units and after the alcohol meal 31.2 units.

Table 5 also compares the percentage incidence of achlorhydria in the three groups and with Caucasians. Four per cent of Caucasian children and 30 per cent

TABLE 5.—*Analysis of Observations on Gastric Acidity*

	Free HCl, Normal Range (Levinson & McFate)	*Free HCl, Healthy Young Africans*	*Free HCl, Ulcer Patients*	*Free HCl, Patients with Other Abdominal Diseases*
Fasting	5-20 units	0-56 units; mean, 17.9	0-420 units; mean, 40.6	0-70 units; mean, 21.5
1 hr. after alcohol meal	30-70 units	0-67 units; mean, 27.7	0-340 units; mean, 55.7	0-91 units; mean, 31.2
Achlorhydria	4% (children) 30% (70 yrs.)	23% (fasting) 19.2% (1 hr. pc.)	12.7% (fasting) 4.2% (1 hr. pc.)	30.7% (fasting) 15.3% (1 hr. pc.)
Hyperchlorhydria (compared with healthy Africans)			17.0% (fasting) 23.4% (1 hr. pc.)	7.6% (fasting) 7.6% (1 hr. pc.)



Curve of gastric acidity in ulcer patient after alcohol meal.

of Caucasian adults at the age of 70 are achlorhydric. In the young, healthy group 23 per cent were achlorhydric in the fasting state and 19.2 per cent were achlorhydric one hour after the alcohol meal. In the group with ulcers the percentages were 12.7 per cent in the fasting state and 4.2 per cent after the meal. Of the group with other lesions found in the abdomen to explain the symptoms, 30.7 per cent were achlorhydric in the fasting state and 15.3 per cent were achlorhydric after the alcohol meal.

From these observations the following conclusions can be drawn: 1. Africans have a greater incidence of achlorhydria than do Caucasians. 2. Healthy Africans show a wider range of gastric acidity than do Caucasians. 3. Africans with duodenal ulcers show a wider range of gastric acidity than do either healthy Africans or those with other intra-abdominal lesions, and their mean levels of free hydrochloric acid are higher. 4. About 17 per cent of African patients with duodenal ulcer are hyperchlorhydric as compared with their healthy young countrymen in the fasting state, and about 23 per cent are hyperchlorhydric one hour after the alcohol meal. 5. The gastric analysis is of diagnostic value only when acid values are well above the normal range for Africans.

The frequent low acid values observed in ulcer patients may offer an explanation of the fact that so few of them obtain relief from the usual medical measures. It may also explain why simple gastroenterostomy gives permanent relief in almost 100 per cent of cases of duodenal ulcer and why marginal ulceration is an extremely rare late complication.

Diagnosis. — The diagnosis of peptic ulcer has become, with experience here, more and more a clinical one. Patients who come to the hospital complaining of epigastric pain, of hard, dark stools and frequently of vomiting, and who are tender in the duodenal area, are probably suffering from a duodenal ulcer. Fluoroscopic observation of the progress of a barium meal usually shows deformity of the duodenum, although a definite niche may not be demonstrated. A clear-cut diagnosis of ulcer cannot be made on the basis of deformity in the absence of the niche, because other conditions simulate duodenal ulcer in causing deformity owing to duodenal spasm.

About 2 out of 5 patients who come to operation with a clinical diagnosis of peptic ulcer are discovered not to have either duodenal or gastric ulcers. Their cases fall into three general groups: 1. Those having adhesions only—from the duodenum and the pyloric area to the stomach, gallbladder and liver, the gallbladder wall itself presenting a normal appearance. Freeing the adhesions reveals no palpable ulcer. This condition is probably a form of duodenitis, which could certainly be the forerunner of an ulcerative process. Of course, one must also consider the possibility of a nonpalpable ulcer, but the extent and toughness of the adhesions, if caused by an ulcer, would lead one to expect a palpable ulcer. 2. Those with a large lymph node adherent to the duodenum. Simple removal of such nodes has cured a few patients. The nodes may not be adherent to the duodenum, but many of them may stud the adjacent omentum and gastrocolic ligament. Smears of these nodes have occasionally demonstrated the filaria of A. perstans, but more frequently no microfilaria are present. Calcified adult filaria may also stud the omentum, the surface of the stomach or the liver. In my opinion, the pain in these cases is due to duodenal spasm, brought on by the irritative action of these microfilaria-filled lymph nodes about the duodenum, and this spasm also causes the deformity observed on fluoroscopic study. 3. Those who show a perfectly normal-appearing duodenum and stomach, without adhesions, but with the mesentery of the small and large bowel loaded with large and small lymph nodes. This condition may be observed also in patients with ulcers. Smears of these nodes invariably give negative results for microfilaria. As most persons in this area, however, harbor A. perstans, which is well known to frequent the retroperitoneal areas, these nodes could very well be secondary to the infestation, and the pain due to mesenteric lymphadenosis.

The histories of the patients without ulcers are often not as clear cut as those of the patients with ulcers. Constipation and dark stools are infrequent complaints, and vomiting is rare. As has been pointed out, the mean gastric acidity in this group is lower than the ulcer group. Epigastric pain is a constant complaint; tenderness in the region of the duodenum is uniformly present, and deformity on fluoroscopic examination is frequent. These patients come to operation after prolonged medical treatment has failed, insisting on surgical exploration. Simple freeing of the adhesions, which are thought to cause pain by their traction, has not given relief when unaccompanied by gastrojejunostomy. Filariacidal drugs have not cleared up the symptoms of those patients on whom gastrojejunostomy has not been performed and in whose nodes microfilaria were present.

Treatment.—Medical treatment is noteworthy for its lack of success. Complete relief of pain from antacids and the belladonna alkaloids was obtained in only 5 of these cases. The patients returned later, however, with recurrent pain.

The greatest contribution of medical treatment lies in the relief of constipation and vomiting. Vomiting is most frequently cleared up. Medical measures are successful in cases of early ulcers more frequently than in those of old ulcers. Probably it would be more successful in the early stages if the patients could consistently follow a proper regime over a long period. Since it is not possible to hospitalize them for long periods, since they usually live far from the sources of drugs and since they frequently do not have the money to continue medical treatment for indefinite periods, the course is invariably interrupted.

Posterior gastrojejunostomy brings immediate and permanent relief in almost 100 per cent of the cases of duodenal ulcer and in very nearly that number in the cases of duodenitis and mesenteric lymphadenosis. Marginal ulcers are extremely rare, having been encountered in only 7 patients. Three patients have had gastrojejunocolic fistulas.

An interesting rare complication was recently observed in 2 patients who had intussusception of the jejunum into the stomach through the anastomotic opening.

The response to gastrojejunostomy is truly remarkable. Patients who were almost emaciated at the time of operation, within a few weeks, look like different persons. Even while they are still in the hospital, the angular faces will become rounded and the loose, flaccid skin smooth and glistening.

Gastric ulcers are treated by subtotal gastric resection.

Mortality.—There were 3 deaths attributable to operations in which gastroen-

(b) disease of the gallbladder and liver; (c) filarial lymphadenitis; (d) mesenteric lymphadenosis of unknown origin. A large percentage of these patients also obtain full or partial relief from gastroenterostomy, or from removal of a node that is adherent to the duodenal wall, but not from the mere freeing of adhesions or the administration of filariacides.

7. Although parasites and psychic trauma possibly play a part in the formation of peptic ulcers among these Africans, it is the author's conclusion that the most likely cause of the disease is malnutrition, particularly with regard to protein and the vitamin B complex.

ZUSAMMENFASSUNG

1. Der Verfasser berichtet über 319 Fälle von peptischen Geschwüren unter Afrikanern.

2. In vielen Gegenden Afrikas ist diese Erkrankung selten, in einer bestimmten Gegend Kameruns ist sie häufig.

3. Von den 319 Geschwüren fanden sich 309 im Zwölffingerdarm und 10 im Magen.

4. In schätzungsweise 98% der Zwölffingerdarmgeschwüre ergab die Gastroenterostomie eindrucksvolle und dauerhafte Heilungen.

5. Unter den 10 Magengeschwüren ergab die histologische Untersuchung in acht Fällen, d. h. in 80%, eine bösartige Form der Erkrankung. Sämtliche Fälle von Magengeschwür wurden mit Magenresektion behandelt.

6. Bei vielen Kranken mit Symptomen und Krankheitszeichen, die auf ein peptisches Geschwür hinwiesen, und die sogar bei fluoroskopischer Untersuchung eine Deformierung des Bulbus duodeni zeigten, fanden sich bei der Operation keine Geschwüre. Andere Krankheitsprozesse, die derartige Symptome erklären können, sind a) Verwachsungsprozesse in der Umgebung des Zwölffingerdarms, b) Erkrankungen der Gallenblase und der Leber und c) durch Fadenwürmer hervorgerufene Erkrankungen der Lymphdrüsen unbekannten Ursprungs. Ein grosser Prozentsatz dieser Kranken kann ebenfalls völlig oder teilweise durch die Gastroenterostomie oder durch Resektion eines mit dem Zwölffingerdarm verwachsenen Knotens von den Beschwerden befreit werden. Dies wird jedoch nicht durch eine blosse Lösung der Verwachsungen oder durch die Verabreichung von Fadenwurmmitteln erreicht.

7. Obgleich Parasiten und psychisches Trauma möglicherweise in der Entstehung peptischer Geschwüre bei Afrikanern eine Rolle spielen können, so kommt der Verfasser doch zu der Überzeugung, dass die Ursache der Erkrankung in unzureichender Ernährung, besonders in mangelhafter Zufuhr von Eiweiss und der B-Vitamingruppe zu suchen ist.

SUMARIO

1. O autor relata 319 casos cirurgicamente confirmados de ulcera peptica, entre africanos.

2. Esta condição rara em muitas areas da Africa, é comum nesta parte de Cameron.

3. De 319 ulceras, 309 ocoreram no duodeno e 10 no estômago.

4. Gastroenterostomia deu alivio imediato e permanente em 98 por cento dos casos de ulcera duodenal.

5. Oito em 10, ou 80 por cento das ulceras, mostraram serem malignas em cortes estológicos. Em todos os casos de ulcera gastrica o tratamento foi a ressecção gástrica.

6. Muitos doentes com sintomas e sinais sugestivos de ulcera peptica mostrando um bulbo duodenal deformado em estudo fluoroscópio, na operação não apresentaram ulcera. Outros processos mórbidos que podem explicar estes sintomas são:

(a) processos de aderência em redor do duodeno; (b) enfermidade da vesícula biliar e fígado (c) lymfadenosis filarica de origem desconhecida.

Uma grande porcentagem destes doentes obtem alivio completo ou parcial pela gastroenterostomia, ou pela remoção do nódulo aderente à parede do duodeno, mas não da simples libertação de aderencias ou por administração de filariacides.

7. Ainda que parasitas e trauma psíquico possivelmente tomem uma parte na formação das ulceras pepticas entre os africanos, é a conclusão do autor que a causa da doença é desnutrição, particularmente no que se refere a proteina o complexo de vitamina B.

RÉSUMÉ

1. L'auteur reporte 319 cas d'ulcère peptique, confirmés chirurgicalément, parmi les Africains.

2. Cette condition, rare dans beaucoup de régions de l'Afrique, est commune dans cette partie du Caméroun.

3. De 319 ulcères 309 occurrèrent dans le duodénum et 10 dans l'estomac.

4. La gastro-entérostomie donnait du soulagement dramatique et permanent dans à peu près 98% das cas d'ulcère duodénal.

5. 8 ulcères gastriques de 10, ou 80% furent trouvés d'être malignes par des sections histologiques. Dans touts les cas d'ulcère gastrique le traitement était la résection gastrique.

6. Beaucoup de patients avec des symptômes et signes d'ulcère peptique, et qui même montraient une déformation du bulbe duodénal à l'examen fluoroscopique, n'avaient pas d'ulcère a l'opération. D'autres conditions de maladies qui pourraient expliquer ces symptômes, étaient: (a) des adhésions autour du duodénum, (b) La lymphadenite filariale d'origine inconnu (c) une maladie de la vésicule biliaire et du foie. Un grand pourcentage de ces patients furent aussi soulagés complêtement ou partialément par la gastro-entérostomie ou par l'excision d'un nodule, qui était adhérant au paroi duodénal, mais pas seulement par la dissection des adhésions ou par l'administration des filariacides.

7. Malgré que des parasites et du traumatisme psychique jouent un rôle dans la formation des ulcères peptiques chez les Africains, la conclusion de l'auteur est, que la cause de la maladie est la malnutrition, spécialément concernant des protéides et de la vitamine B.

REFERENCES

1. Mattlett, G.: Deux Cas d'Ulcère Gastrique Chez le Noir, Ann. Soc. Belge Med. Trop. 13:317, 1938.

2. Roberts, G.: Peptic Ulcer in Uganda, East African M. J. 14:88, 1937.

3. Connell, W. K.: Duodenal Ulcer in Tanganyika, East Africa M. J. 14:89, 1937.

4. Kenya (Colony) Medical Department, annual report, 1951, p. 26.

5. Vassalo, S. M.: Duodenal Ulcer in Zanzibar, East African M. J. 14:73, 1937.

6. Sorge, E.: Il Trattemento Chirurgico dell'Ulcero-Gastroduodenale en Eritrea, Bol. Soc. Ital. Med. Ig. Trop. (sec. Eritrea) 6:431, 1946.

7. Ferro-Luzzi, G.: Studio Sull 'Ulcero-Gastroduodenale en Eriteria, Bol. Soc. Ital. Med. Ig. Trop. (sec. Eritrea) 6:431, 1946.

8. Eagle, and Gilman: The Incidence of Peptic Ulcer in the South African Bantu, South African J. Med. Sci. 3:1, 1948.

9. Beyers, C. F.: Incidence of Surgical Disease Among the Bantu Races of South Africa, J. M. A. South Africa 1:606, 1927.

10. Sturdevant, M., and Shapiro, Y.: Gastric and Duodenal Ulcer; Frequency, Number, Size, Shape, Location, Color, Sex and Age in Seven Thousand Seven Hundred Necropsy Records at Bellevue Hospital, New York, Arch. Int. Med. 38:41, 1926.

11. Ellis, M.: A Study of Peptic Ulcer in Nigeria, Brit. J. Surg. 36:60, 1948.

12. Levinson, and McFate: Clinical Laboratory Diagnosis. Philadelphia: Lea & Febiger, 1943. pp. 53 and 56.

13. Aitken, B.: Remarks on Peptic Ulcer, West Africa M. J. 6:63, 1932.

Cardiac Arrest Associated with Coronary Occlusion: Successful Resuscitation

ATTILIO CELIO, M.D.
BASEL, SWITZERLAND

SUDDEN death due to coronary occlusion is by no means always in direct proportion to the extent of the infarct. There is reason to believe that in cases of minor infarction cardiac failure is due less to the extent of the myocardial damage than to a *reflex process.* As with other and similar forms of cardiac arrest, one is then faced with the problem of resuscitation of the heart.

Attempts in this direction have been made, although they do not seem to be reported in the literature.

Papper* has stated that he knows of several cases in which cardiac massage was performed under such conditions. To the best of his knowledge all such attempts were unsuccessful, as a result of which the Presbyterian Hospital of Columbia University Medical Center, New York, decided not to pursue further efforts in this direction.

One case observed in this department may perhaps induce a revision of this negative attitude.

REPORT OF CASE

A 46-year-old white man had a family history of frequent "strokes" and cardiac disease.

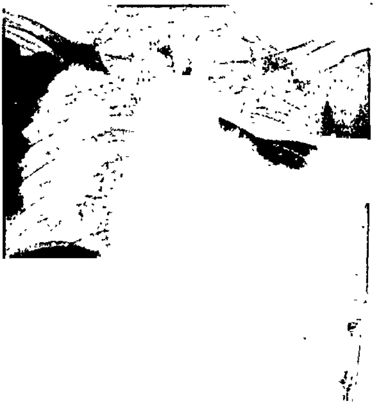


Fig. 1.—Anteroposterior thoracic roentgenogram taken with patient lying down. Note that heart is decidedly enlarged to both right and left, with definite dilatation of left ventricle. Note effusion in left pleural cavity, with relatively good expansion of left lung.

From the Department of Surgery, University of Basel (Prof. Dr. R. Nissen, Surgeon-in-Chief).

The case here reported was presented at a meeting of the Swiss Surgical Society in Baden, Switzerland, in May 1956.

Submitted for publication Jan. 11, 1956.

*Personal communication.

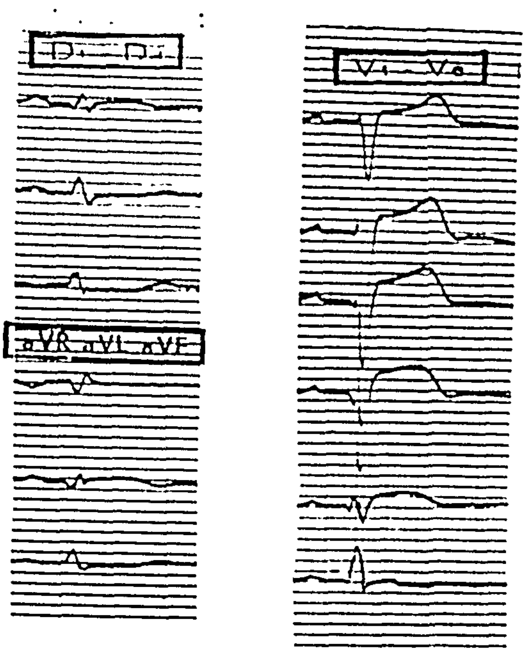


Fig. 2.—Electrocardiograms taken March 24, 1955, one week after cardiac massage; sinus rhythm, microvoltage, pathologic Q waves and elevation of ST segments in D_1 (aVL) V_2-V_6.

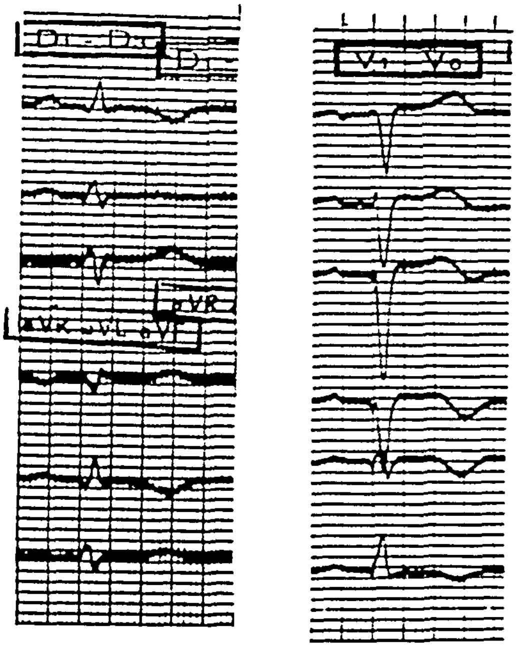


Fig. 3.—Electrocardiograms taken on April 12, three weeks later: regression of ST segment elevation; development of coronary inverted T waves D_1 (aVL) V_1-V_6.

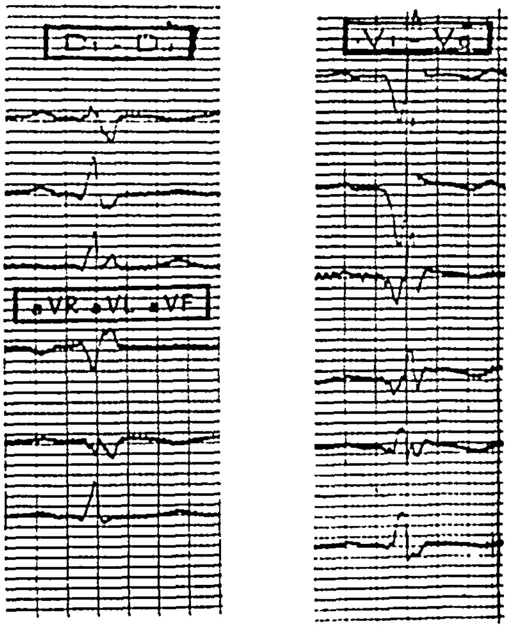


Fig. 4.—Electrocardiograms taken on May 20, nine weeks later: myocardial infarction of the anterior wall, associated with right bundle branch block.

About twenty-four years ago, during some strenuous exertion in military service, the patient suddenly felt a violent pain in the left breast and was forced to remain lying on his stomach for two hours. After this, he recovered fairly well. He was transferred, however, to a different military branch, since he was no longer equal to the exertions demanded by infantry training.

In his professional activities he often suffered also from precardial pains on exertion.

Two years prior to the time of writing the patient was under treatment for a duodenal ulcer, the presence of which was confirmed by roentgen ray. On the evening before admission he complained of violent epigastric pains radiating into both arms; there was neither vomiting nor nausea. After some time, the pains subsided sufficiently for him to sleep.

On the day of admission, at about 8 a.m., sharp pains again developed in the epigastrium. The patient left his work and went home, where he took sodium bicarbonate in order to vomit. The vomitus was not unusual, consisting only of his breakfast. The family doctor gave him a sedative by injection and sent him to the hospital with a diagnosis of "acute appendicitis and cold."

On admission (March 17, 1955), the patient complained of epigastric pains radiating from behind the sternum into both arms; he "felt as though his arms were falling off." The abdomen was soft. Orally, the temperature was 36.5 C. (97.7 F.); rectally, 37 C. (98.6 F.). The leukocyte count was 11,850 per cubic millimeter of blood. The urine contained sugar and traces of albumin; the sediment was normal. The blood pressure in millimeters of mercury was 155 systolic and 105 diastolic; the pulse rate per minute, 75.

It should be noted that the weather was damp and thundery on this particular day.

Since the diagnosis of acute appendicitis could not be confirmed, the patient was kept under observation. The pains slowly subsided.

During early afternoon the patient was visited by his wife. Shortly after her departure he felt unwell, turned blue and stopped breathing. Summoned by the nurse, I found the patient motionless and cyanotic, with corneal reflexes absent, no pulse, no respiration, no audible heart sounds. Thoracotomy and cardiac massage were immediately carried out, approximately two to three minutes after the beginning of cardiac arrest. There was no bleeding from the incision. The heart showed ventricular fibrillation. Twice defibrillation was attempted, but failed. While massage of the heart continued, a third defibrillation was followed by cardiac standstill. Massage was continued, and spontaneous contraction finally set in some thirty minutes after massage had first been instituted.

Respiration returned rather quickly and of its own accord; exactly when this took place it is impossible to say, since all my efforts were concentrated on the heart at this time. At all events, intubation was not necessary; initially, positive pressure breathing with the mask was sufficient to maintain respiration.

The electrocardiogram (Fig. 2) at this time showed absolute arrhythmia and (probably) left bundle branch block, with microvoltage.

A few minutes later the absolute arrhythmia disappeared and the heart began to beat normally; the blood pressure in millimeters of mercury settled at 115 systolic and 75 diastolic. Since the patient was excitable, small doses of largactil (thorazine) were given him.

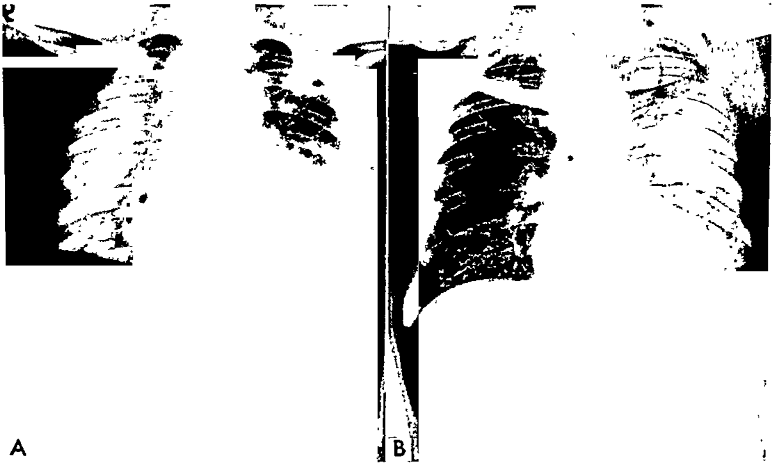


Fig. 5.—*A*, anteroposterior thoracic roentgenograms taken with patient lying down. Note marked enlargement of heart to left and right, with definite involvement of left ventricle. Expansion of left lung is good. There is effusion in left pleural cavity. *B*, anteroposterior thoracic roentgenogram taken with patient standing. Note moderately enlarged heart, with hypertrophy and moderate dilatation of left ventricle. No signs of pulmonary stasis. Small hydrothorax on left, pleuromediastinal adhesions in basal segments of left margin.

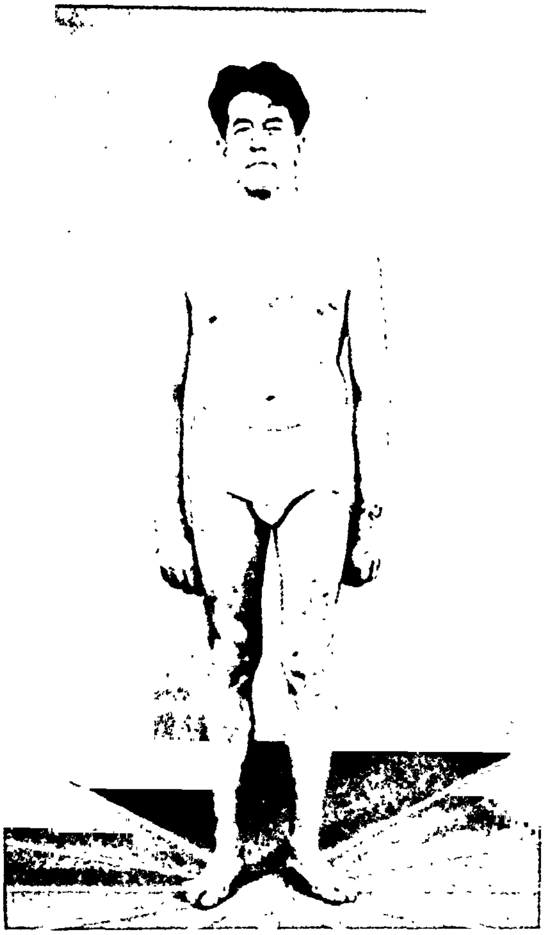


Fig. 6.—Patient on discharge.

On the first day after the operation the patient complained of pains. The abdomen remained soft; the electrocardiogram showed microvoltage, sinus tachycardia, partial right bundle branch block and disturbances of the ST segment.

There was still glycosuria. The value for serum amylase was normal. A few hyaline cylinders were observed in the sediment. The leukocyte count was 12,150 per cubic millimeter of blood.

On the second postoperative day the patient was able to converse for a short time with his wife and to drink unaided. By the third day he was able to talk without becoming exhausted.

By the fourth day he was able to give orders concerning his business from the bedside. His power of association was intact, but his memory was disturbed with respect to recent happenings. The electrocardiogram was normal. Thoracic roentgenograms showed a markedly enlarged heart and a small effusion in the left pleural cavity, the left lung being relatively well expanded (Fig. 1).

In the electrocardiogram the ST segment was elevated in V_3-V_5, and there were Q waves in V_2-V_6, which suggested the presence of a myocardial infarction of the anterior wall.

On the seventh day the electrocardiogram showed clear signs of anterior myocardial infarction of the anterior wall (pathologic Q waves in D_1, aVL, V_2-V_6, elevated ST segments in V_2-V_5, flat T waves, microvoltage in the frontal plane projections [Fig. 2]). The thoracic roentgenograms (Fig. 5), after removal of the drains, showed good expansion of the left lung with a large heart shadow. The patient felt well.

On the tenth day (March 27) the patient was pale, sweating and extremely anxious. He complained of pains similar to those felt on admission, concentrated particularly in the stomach and radiating partially toward the left breast and partially to the right, downward and toward the right flank. The white blood cell count, earlier 9,000 per cubic millimeter, had risen to 15,000. There was slight hypochondrial tenderness on the right. No sugar remained in the urine. The oral temperature was 38.1 C. (100.6 F.) and the rectal temperature 38.6 C. (101.5 F.). The condition was interpreted as renewed myocardial ischemia. Patient was given liquemin; the penicillin he had been receiving was replaced by ilotycin. Streptomycin therapy was continued. The electrocardiogram was unchanged.

The pains subsided completely within two days, and the subsequent course was uneventful. The temperature was normal from the second week on. Anticoagulant therapy had to be interrupted on the seventeenth day in view of hematuria but was resumed during the third week.

At the end of three weeks the patient was free of subjective symptoms; he looked well, and a thoracic roentgenogram showed satisfactory reexpansion of the left lung; the pleural effusion had been largely reabsorbed; the heart shadow remained large. There were coronary inverted T-waves in D_1, aVL and V_4-V_6 (Fig. 3).

The subsequent course was uneventful. After six weeks the patient was allowed to get up. Subjectively, he felt well. The leukocyte count was normal and the prothrombin time within therapeutic limits. There was no essential change in the thoracic picture. The electrocardiogram showed the status after anteroseptal anterior wall infarction with right bundle branch block (Fig. 4).

The patient recovered rapidly. He had no difficulty in walking. Prior to discharge the gastrointestinal tract was examined roentgenographically, revealing a scarlike deformed bulb with duodenal ulcer, slight duodenitis and enteritis. The last roentgenogram of this patient taken in the hospital was described by the roentgenologist (Prof. Zdansky) as showing a moderately enlarged heart, with hypertrophy and moderate dilatation of the left ventricle; there were no signs of pulmonary stasis. There were still signs of a small left hydrothorax and (probably) pleuromediastinal adhesions in the basal segments of the left margin (Fig. 5). The electrocardiogram showed definite evidence of an anterior wall myocardial infarction in the presence of a right bundle branch block (Fig. 4).

The diagnosis was status post anterior wall septum infarctus, right bundle branch block.

The patient was discharged on May 21, 1955. The erythrocyte sedimentation rate was 8/15 and the hemoglobin level 89 per cent. There were 4,900 leukocytes per cubic millimeter of blood (Fig. 6). At the end of July 1955, the patient was able to resume his work as a carpenter.

Naturally, the first question will be whether this really was a case of primary coronary occlusion or whether the massive manipulations of the heart muscle during massage might not have been responsible for the electrocardiographic changes.

To cite my own experience, I should mention that in our department heart massage for cardiac arrest has been successfully performed seven times in the past three years. The patients included a 39-year-old woman in whom regular heart activity was not restored until thirty-six minutes after massage was begun.* Not one of these patients showed electrocardiographic changes that even remotely suggested coronary occlusion.

Moreover, in view of the typical earlier history, I am inclined to the opinion that no other explanation than that of cardiac arrest due to coronary occlusion might be found.

The reflex nature of the heart failure could be explained by the localization of the infarct in the region of the nerve-conducting system.

The fact that ventricular fibrillation was observed with the heart exposed would agree with the most common cause of death due to coronary occlusion.

I am well aware that the successful outcome of cardiac massage in this case was due to a combination of several favorable circumstances—the fact that the patient was in a surgical department, where doctors are acquainted with the technic of cardiac massage; the fact that the doctor happened to be near by, and, not least, the fact that the patient was comparatively young.

At the same time, however, these same conditions may very well occur again. Obviously, cardiac massage can be performed only in the hospital, but a number of patients with initial signs of threatened infarction will nevertheless be transferred in good time to the department of internal medicine. Since, thanks to the absence of bleeding and the permissibility in such cases of ignoring the danger of infection, such massage can be performed even by doctors with no surgical training; I see no reason why this procedure should not be adopted by internists as well. Once cardiac massage has been begun, the anesthetist can be called to supervise controlled respiration and the surgeon to attend to the wound. In view of the short time (two to three minutes) available if there is to be any promise of successful resuscitation, the delay incurred in sending for a surgeon and an anesthetist involves the danger of irreparable cerebral damage in the event that cardiac function is restored.

SUMMARY

A 46-year-old man with a history of angina pectoris was admitted to the Surgical Department of the University s-

---

*Eckmann, L., Allgöwer, M. Langenbecks Arch. 280:451, 1955.

pital of Basel with a diagnosis of acute appendicitis. On the day of admission, as on the previous day, the patient had an anginal attack, with typical localization of pain, leukocytosis, glucosuria and softness of the abdomen. In the hospital there was a further attack, followed by sudden cardiac arrest. Cardiac massage was immediately begun, revealing ventricular fibrillation. After thirty minutes' massage and three attempts at defibrillation, cardiac function was restored. Electrocardiographic examination revealed an anteroseptal myocardial infarction. The patient recovered completely.

The advisability of instituting transthoracic heart massage in cases of sudden cardiac arrest due to coronary occlusion is discussed.

Author's Note: The author expresses his appreciation to Prof. H. Staub and Dr. W. Schweizer, of the Department of Internal Medicine, for their help in appraising the electrocardiographic observations.

ZUSAMMENFASSUNG

Ein 46 jähriger Mann mit einer Angina-pectoris-Anamnese wurde in die chirurgische Abteilung des Baseler Universitätskrankenhauses mit der Diagnose einer akuten Blinddarmentzündung eingeliefert. Am Tage der Krankenhausaufnahme und am Tag vorher hatte der Kranke einen Anfall von Angina pectoris mit typischer Lokalisierung des Schmerzes, Hyperleukozytose, Glykosurie und weichem Bauch. Ein weiterer Anfall im Krankenhaus war von einem plötzlichen Herzstillstand gefolgt. Herzmassage wurde unverzüglich eingeleitet, und es ergab sich ein Flimmern der Herzkammern. Nach 30 Minuten lang dauernder Herzmassage und nach drei Versuchen, das Flimmern zu beseitigen, war die Herzfunktion wiederhergestellt. Die elektrokardiographische Untersuchung ergab einen Herzmuskelinfarkt im vorderen Septum. Der Patient erholte sich völlig.

Es wird die Frage erörtert, ob nicht in Fällen plötzlichen Herzstillstandes als Folge eines Verschlusses der Kranzschlagadern die Einleitung einer transthorakalen Herzmassage angeraten ist.

RIASSUNTO

Un uomo di 46 anni, con una storia di angina pectoris, fu ricoverato di urgenza all'Ospedale dell'Università di Basilea con la diagnosi di appendicite acuta. Il giorno dell'ingresso, come anche il giorno prima, il paziente aveva avuto un attacco anginoso con dolore a localizzazione tipica, leucocitosi, glicosuria, addome trattabile. In ospedale il paziente ebbe un altroattacco seguito a arresto cardiaco. Si fece immediatamente il massaggio cardiaco, che dimostrò fibrillazione ventrivolare; dopo 30 minuti e 3 tentatividi defibrillazione la funzione cardiaca riprese. L'esame elettrocardiografico dimostrò un infarto anterosettale. Il paziente guarì completamente. Viene discussa la necessità di intraprendere il massaggio cardiaco transtoracico nei casi di improvviso arresto cardiaco cardiaco dovuto ad occlusione coronarica.

SUMARIO

Um homem de 46 anos com historia de angina pectoris foi admitido ao Departamento de Cirurgia da Universidade Hospital de Basel com diagnostico de apendicite aguda. No dia da admissão, como no previo, o paciente tinha tido uma crise de angina com típica localização de dor, leucocitose, glicosuria e reação abdominal. No hospital o paciente teve nova crise com parada cardiaca Iniciada imediatamente a massagem cardiaca, surgiu a fibrilação ventricular Depois de trinta minutos de massagem e tres tentativas de desfibrilação, a função cardiaca foi restabelecida. Exame eletrocardiografico revelou um infarto miocardio, antero septal.

O paciente recuperou-se completamente. A possibilidade de instituição da massagem cardiaca transtoraxica em casos de parada cardiaca devido à oclusão coronaria é discutida.

RÉSUMÉ

Un homme agé de 46 ans avec l'histoire de l'angine pectorale fut admis au departément chirurgical de l'université de Bâle avec le diagnostic d'appendicite aigüe. Le jour de l'admission, comme au jour precedante le malade avait une attaque angineuse avec localisation charactéristique de la douleur, leucocytose, glycosurie et mollesse de l'abdomen.

A l'hôpital le malade eut une autre attaque, suivie de soudain arrêt cardiaque. On appliqua tout de suite le massage cardiaque et on découvrit de la fibrillation ventriculaire. Après 30 minutes de massage et 3 essays de défibrillation la fonction cardiaque fut restaurée. A l'examen électrocardiographique un infarctus myocardial, antéroseptal fut trouvé. Le malade se remetta complêtement.

La recommandation d'appliquer le massage transthoracique du coeur dans les cas d'arrêt cardiaque soudain est discutée.

◆

> It is a curious fact that Americans and Europeans differ widely in their thinking about the traditional treatment of death. For centuries death has been chosen for some of the most outstanding creations in European art, drama, and literature. This world of art made man familiar with the stark realities of death, and its majesty and terror were and are being emphasized abroad far beyond anything known in this country. This cultural difference may well interest our psychology experts for some time to come as both continents are interchanging their heritage and traditions more intimately than in years past. European observers regard our ways of veiling death or the dressing of it in a new Hollywood mythology as a strange and often tasteless evasion of truth. . . .
>
> Somehow these semihumorous and good-natured plays express the anonymity of modern mass man and, incidentally, seem also aimed at removing the fear of death from us who have witnessed more mass dying than earlier generations.
>
> Are we thus transferring man's most inescapable problem to the realm of pretty illusions? And are we in doing so perhaps also neglecting to prepare man to face reality and meet death for himself and others in dignity and inward readiness?
>
> —*Anonymous*

Intrahepatic and Extrahepatic Portal Venous Thrombosis

Report of a Case

WALDYR DA SILVA PRADO, M.D., F.B.C.S., F.I.C.S.*
AND
JOSE LUIZ CAMARGO BARBOSA, M.D.**
SAO PAULO, BRAZIL

WE wish to report in this paper a case that derives its chief interest from its rarity. Portal hypertension and giant splenomegaly, probably resulting from Schistosomiasis mansoni, were present. The condition was surgically treated.

REPORT OF CASE

The patient, a white Brazilian married man aged 40, came to our service complaining of an abdominal mass. He stated that, four years prior to consulting us, he had been at work as usual, feeling well, when he was suddenly attacked by nausea, shivering and profuse perspiration and vomited pure blood to the amount of "a glass of water." At this moment, he said, he "lost his senses" and was distracted for some minutes, after which he arose, feeling extremely weak, and went home. For approximately five or six weeks thereafter he felt better, but at the end of this time the bloody vomit reappeared, with greater intensity. He stayed in bed at home for some days and was treated with home remedies. After the twelfth episode of vomiting he noticed that an abdominal mass was present under the left ribs and was gradually but steadily increasing in size. At the time of his admission to our service the mass was still present in the left iliac fossa. He had passed through the intervening period fairly well and had vomited no more blood, but stated that he had not been feeling well after meals. Anorexia and occasional diarrhea had been present. Melenic stools had sometimes been passed after the patient had vomited blood.

The patient was a Bahian farmer who was accustomed to bathe in neighboring lakes (this first suggested the possibility of schistosomiasis). Physical examination revealed but little adipose tissue. The mucosal surfaces were discolored; the skin was dry, and the man's general condition was poor. Examination of the heart revealed bradycardia and a systolic murmur at the mitral focus, without the characteristics of organic damage. The abdomen was of the "frog" type, with flaccid muscles. The spleen was greatly enlarged, growing in the left iliac fossa to a point past the midline. Its borders were hard, smooth and not tender. The liver was also very large, extending about 6 fingerbreadths below the costal margin, its borders being flat, smooth and nontender like those of the spleen. No sign of ascites was observed. There was no visible collateral circulation. A hemogram showed profound anemia, with 28 per cent hemoglobin. The value for total proteins was 5.6 Gm. per hundred cubic centimeters. The coagulation time was increased.

The urine was normal. Ancilostoma duodenalis was present in the stools. Serologic reactions for syphilis (Wassermann, Kahn, Megliano) were negative.

Because of the patient's poor general condition, a preoperative regimen was set up on the basis of blood and plasma transfusions and the administration of iron, vitamins, proteins, etc. During this period other examinations were made, including a proctologic study with removal of a biopsy specimen from the rectum in order to determine whether Schistosoma

---

*Chief of Staff, Santa Casa de Misericordia de Sao Paulo.

**Adjuvant Surgeon, Santa Casa de Misericordia.

From the service of Dr. Jono Montenegro, Surgical Infirmary.

Submitted for publication Dec. 7, 1955.

mansoni was present. The results of this study were negative.

During the same period a splenoportographic study was made (Fig. 1), revealing great dilatation and lengthening of the splenic and portal veins. It is important to point out that there was free transit through the venous lumens, with no signs of obstruction until the veins reached the hepatic parenchyma. There were roentgen signs of portal hypertension, probably due to hepatic cirrhosis; this was easily observable in the lumens of the veins.

Tests of hepatic function were made. The Weltman test showed flocculation up to the eight tube. The Hanger reaction was 1 per cent. The Takata-Ara test gave a position result (albumin, 2.9 per cent; protein, 5.7 per cent, and globulin, 3.4 per cent).

Under rigorous treatment for two months after admission the patient improved sufficiently to justify surgical intervention. At this time the value for hemoglobin was 95 per cent and the value for blood proteins 6.5 Gm. per hundred cubic centimeters.

Splenectomy was performed by one of us (W. da S. P.) under extremely difficult conditions, the spleen being enormously enlarged and the splenic veins thin and friable. During ligation of the splenic vein the thread entered the vein, causing massive hemorrhage, which forced rapid dislocation and ligature of the spleen *en masse* with the splenic pedicle near the tail of the pancreas.

During the operation the blood pressure fell, but at the end it had risen to the normal level. Because of the aforedescribed accident, it was impossible to determine the portal venous pressure immediately after the procedure.

Before the abdomen was closed, a biopsy specimen was taken from the liver and revealed normal hepatic tissue. Examination of the excised spleen showed chronic splenomegaly. On the day after the operation a hemogram was taken, revealing a hemoglobin level of 50 per cent, and a blood transfusion was given.

The postoperative period was also marred by accident. On the seventh day there were signs of the spread of liquid in the base of the left lung, confirmed roentgenographically. As the spread was not extensive, no puncture was done, and the patient was treated clinically. He had slight fever, cough and expectoration for sixteen days, after which he improved greatly.

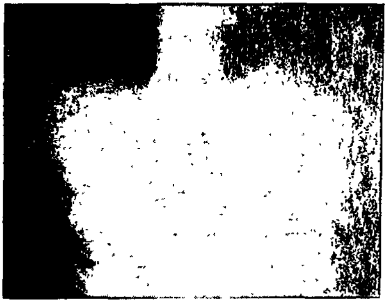


Fig. 1.—Roentgenogram taken in a case of postoperative thrombosis (see text).

On the twentieth postoperative day there occurred one more hematemesis, and the patient vomited approximately 200 cc. of partially coagulated blood. Antishock treatment (transfusion, oxygen, etc.) was immediately administered, and in the evening he felt better. On the next day he had diarrhea, with melenic stools. From the time of the postoperative hematemesis his general condition grew worse; the hematemeses increased in frequency to such a degree that the patient was *virtually living on daily blood transfusions.* During the hematemeses the blood pressure fell to zero. Little by little there appeared signs of ascites, which was treated with small doses of mercurial diuretics.

After one hematemesis the patient sank into a comatose state lasting three days, after which time he felt better and his general condition improved greatly. With repeated blood transfusions, we expected an opportunity to administer an endoscopic sclerosing treatment of the esophageal varices, but again the patient's general health declined, and he died in January 1954, two months after the operation.

At autopsy, thrombosis of the portal and mesenteric veins was present, in addition to *intrahepatic venous thrombosis.* Diffuse hepatic stenosis was present, as were esophageal varices. The cause of death was recorded as hemorrhage of the digestive system. In the esophagus we observed veins that were much dilated but otherwise normal. The stomach was filled with blood and mucus and the entire intestinal tract contained much blood. The splenic and mesenteric veins were dilated and thrombotic, the thrombi being peripherally red and centrally white. The por in w

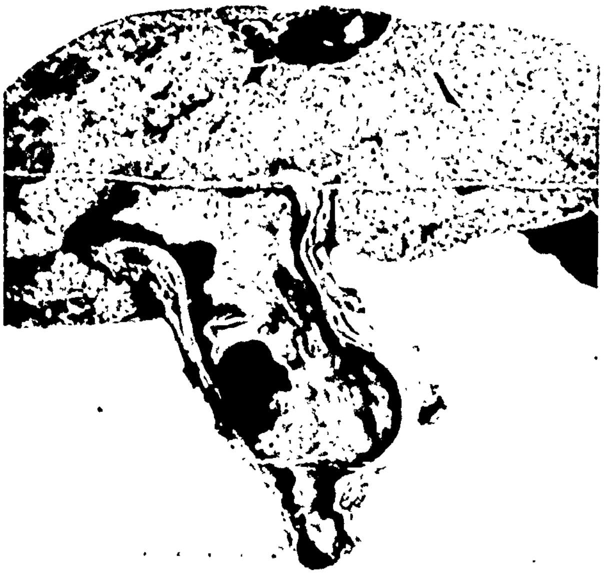


Fig. 2.—Postoperative thrombosis of the portal vein in its intrahepatic and extrahepatic portions (see text).

thrombotic and dilated, with a circumference of 12 cm. The liver was greenish yellow and hard. On section, the intrahepatic extensions of the vein were also dilated and thrombotic, ending near the capsule (Fig. 2). The smaller veins were also thrombotic. Anemia and fibrinopurulent peritonitis were present, with pericardial cisticercosis, hypertrophy of the left ventricle and myocarditis chagasica.

The anatomopathologists (Drs. Walter E. Maffei and Carlos Marigo) remarked that, although a clinical diagnosis of Frugoni's syndrome, i.e., thrombosis of the splenic vein, seemed justifiable, the surgically removed spleen indicated only splenomegaly. They pointed out that the portal vein was badly formed, as indicated by its large caliber both within the liver and outside it, which suggested an actual organ rather than a vein. They therefore concluded that the thrombosis was the result of acute myocarditis and of injury due to the peritonitis caused by the operation.

COMMENT

We are still of the opinion that the giant splenomegaly in this case had a schistosomatic origin. This is a region highly infested by S. mansoni. Any damage resulting from the operation was due solely to mechanical difficulties with the enormous spleen; otherwise the operation would have decreased the portal hypertension. On the basis of the autopsy, however, the anatomopathologic opinion was that the portal vein was congenitally anomalous, causing the thrombosis and later the great increase of pressure in the portal vein that resulted in death.

SUMMARY

A case is reported of portal hypertension with chronic splenomegaly in which, after intensive preoperative therapy, the patient was splenectomized. Hematemeses, beginning twenty days after the operation, increased daily in frequency, and in spite of all efforts to control it the patient died.

At autopsy it was observed that large thrombi were present in the splenic and portal veins. This had been observed at operation and even in a splenoportographic study.

RIASSUNTO

Viene riferito un caso di ipertensione portale con splenomegalia cronica, sottoposto a splenectomia dopo trattamento intenso preoperatorio. Dopo 20 giorni dall'intervento comparve una ematemesi che crebbe di intensità progressivamente fino a produrre la morte senza che fosse possibile controllarla.

SUMARIO

Os AA. apresentam um caso de hipertensão portal com enorme splenomegalia, de provavel origem schistosomótica, o qual, após intenso tratamento pré-operatorio foi submetido a uma splenectomia. Vinte dias após a operação o paciente apresentou hematemesis, que, aos poucos, foram aumentando em frequencia e intensidade e, apesar de todo o tratamento in-

stituido, levaram o paciente á morte. A autopsia revelou extensa trombose das veias splenica e porta o que não havia sido evidenciado durante o ato operatorio e mesmo ao exame de uma splenoportographia á qual o paciente havia se submetido no pré-operatorio.

ZUSAMMENFASSUNG

Es wird über einen Fall von portaler Hypertension mit chronischer Splenomegalie berichtet, in dem nach umfangreicher präoperativer Behandlung die Milz reseziert wurde. Zwanzig Tage nach dem Eingriff setzte blutiges Erbrechen ein, dessen Häufigkeit sich von Tag zu Tag steigerte und trotz aller Versuche, es zu stillen, zum Tode führte.

RÉSUMÉ

On reporte un cas d'hypertension portale avec splénomegalie chronique, ou la malade, après un traitement intense préopératoire fut sujet à la splénectomie. Hématemesis commenca 20 jours après l'opération, accrut en fréquence de jour en joue et—malgré touts les essays de l'arrêter—le patient succomba.

◆

Philosophy, if rightly defined, is nothing but the love of wisdom.

—*Cicero*

Never rise to speak till you have something to say; and when you have said it, cease.

—*Witherspoon*

The infinitely little have a pride infinitely great.

—*Voltaire*

There is not a person we employ who does not, like ourselves, desire recognition, praise, gentleness, forebearance, patience.

—*Beecher*

Half uttered praise is to the curious mind, as to the eye half veiled beauty is more precious than the whole.

—*Baillie*

In private conversation between intimate friends the wisest men very often talk like the weakest; for indeed, the talking with a friend is nothing else than thinking aloud.

—*Addison*

Genitourinary Surgery

Diagnostic and Therapeutic Problems Incident to the Surgical Treatment of "Malignant" Renal Calculous Disease

FRED K. GARVEY, M.D., F.A.C.S., D.A.B.
AND
WILLIAM H. BOYCE, M.D.
WINSTON SALEM, NORTH CAROLINA

IN North Carolina the majority of patients with renal calculi have small stones that are passed spontaneously or with the aid of cystoscopic manipulation.[1] In approximately 15 per cent of patients subject to renal calculi the stones form with such rapidity or are of such size that the patient's life is endangered either from renal failure or from the pathologic process that initiated the calculus formation. The treatment of such patients taxes both the surgeon's operative skill and his ingenuity in preoperative and postoperative management.

The prime indication for open surgical intervention is the presence within the urinary tract of a calculus too large to be passed spontaneously. The only contraindication to the surgical removal of such a calculus is the presence of advanced progressive disease, such as cancer or multiple myeloma, which offer the patient a relatively short life expectancy. Even though the calculi may be currently asymptomatic, large, bilateral or associated with impairment of renal function, planned lithotomy is not necessarily contraindicated. Few patients will be encountered with calculi that have produced renal destruction to such a degree that operation cannot be performed safely *if the patient is properly prepared.* It is the purpose of this report to consider problems peculiar to the care of patients who are considered to have renal calculous disease in a malignant phase.

Diseases That May Contribute to Recurrent Renal Lithiasis.—A number of diseases are associated with an increased incidence of renal lithiasis. Although no one of these is a major cause of recurrent calculi, the urologist who would attain maximum success in the treatment of calculous disease must be aware of their distinguishing characteristics (see accompanying table).

Primary Hyperparathyroidism: Renal complications have been reported in 30 to 70 per cent of patients with hyperparathyroidism.[2] The classic manifestations are hypercalcemia, hypophosphatemia, increased urinary excretion of calcium, and elevated values for serum alkaline phos-

---

From the Department of Urology, Division of Surgery, the Bowman Gray School of Medicine of Wake Forest College, Winston Salem.

Read at the Twentieth Annual Congress of the United States and Canadian Sections, International College of Surgeons, Philadelphia, Sept. 12-15, 1955.

Submitted for publication Jan. 1, 1956.

phatase.[3] It should be emphasized that the disease has periods of latency, and, when its presence is suspected, the diagnostic tests should be repeated at intervals of several weeks, preferably after the patient has been treated with an increased calcium intake. Familiarity with the many manifestations of the disease[4] and a persistent search for the pathognomonic signs will eventually establish the diagnosis.

Milk-Alkali (Burnett) Syndrome: Described by Burnett and his co-workers in 1949,[5] this syndrome has many features in common with primary hyperparathyroidism, and a clear distinction may not always be possible.[6] The salient features include a history of prolonged intake of milk and absorbable alkali, hypercalcemia without hypercalcinuria or hypophosphatemia, absence of demonstrable bone disease, mild alkalosis, renal insufficiency and calcinosis. Among the 24 cases of this syndrome reported to date, nephrolithiasis was present in 4 and nephrocalcinosis in 5.[7]

Multiple Myeloma: Clinically, roentgenographically and biochemically, this disease may simulate hyperparathyroidism. The serum alkaline phosphatase content is rarely elevated, and the presence of Bence-Jones protein in the urine, the absolute increase in serum globulin, the characteristic disturbance in the electrophoretic patterns of the serum proteins and the demonstration of plasma or "myeloma" cells in the peripheral blood or bone marrow are important, but not infallible, aids in establishing the diagnosis.[8]

Renal Tubular Acidosis: This may be a congenital[9] or acquired[10] state characterized by loss of the kidney's ability to excrete acid urine, with fixation of the urinary *p*H at near neutral or alkaline levels. There is a generalized increase in the urinary excretions of cations associated with subnormal values for serum calcium, inorganic phosphorus, sodium and potassium. The carbon dioxide combining power of the plasma is lowered, and the chloride content is usually elevated. When renal failure causes a secondary stimulation of parathyroid activity the biochemical picture may be so confused as to make the diagnosis exceedingly difficult.

The oral administration of ammonium chloride will serve as a diagnostic test. In the presence of normal tubular function, the urine should develop a *p*H of 5.5 or less within thirty minutes to two hours after administration of 10 to 15 Gm. of the salt. Enteric-coated tablets and sodium acid phosphate are not suitable for the test, and it should not be applied to patients with disease of the liver or severe "acidosis." A "false negative" result may be obtained in the presence of infection of the urinary tract with urea-splitting organisms.

Renal Rickets: This condition is characterized by evidence of chronic renal insufficiency, with elevation of the blood urea nitrogen level. Biochemical tests reveal severe acidosis, with low values for serum calcium and normal values for serum alkaline phosphatase activity. As a result of the stimulus supplied by the decreased serum calcium, the parathyroid glands may undergo hypertrophy, and failure of the impaired renal tubules to respond to the increased parathyroid activity may cause elevation of the inorganic phosphorus to levels of 12 to 20 mg. per hundred grams of serum.

Acute Osteoporosis: This condition may develop when a young adult is suddenly immobilized as a result of injury, particularly if the injury produces multiple fractures of bones or severe burns. The renal complications of this type of injury have appeared to diminish in number with the recent emphasis on early ambulation and correct fluid and protein therapy.[11]

Hypervitaminosis D: A history of excessive ingestion of vitamin D will usually suggest the diagnosis of this cond

The patient frequently presents multiple sites of abnormal calcification, together with hypercalcemia and hyperphosphatemia; the value for serum alkaline phosphatase, however, is usually normal.

Sarcoidosis (Boeck's): Renal calcification and calculus formation are not infrequent symptoms of this disease.[12] Biochemically, in most cases, it is characterized by hypercalcemia with a normal value for serum phosphorus, hyperproteinemia with an increase in the globulin fraction, and elevation of serum alkaline phosphatase activity. The diagnosis is facilitated by recognition of the characteristic cutaneous lesions and the roentgenographic observation of bone lesions in the hands and feet, and it is confirmed by demonstration of lymphogranulomatosis in biopsy specimens.

Paget's Disease (Osteitis Deformans): This fairly common disease, estimated to be present in 3 per cent of persons over 40 years of age, may be associated with renal calculus formation.[13] The level of serum calcium is usually normal and that of alkaline phosphatase elevated; the inorganic phosphorus content may be normal or elevated. Roentgenographically, the disease is characterized by an increase in both size and density of the bones, with bowing of the extremities. Characteristically, normal bone is seen adjacent to areas of bone destruction and contiguous bone repair.

Malignant Tumor with Osseous Metastases: This disease may be associated with hypercalcinuria and elevation of the serum calcium level, but the serum inorganic phosphorus content is normal or slightly elevated. The skeletal lesions are rarely found below the knees or elbows, and bone structure adjacent to the lesions appears normal. In the majority of cases, the patient's history should suggest this diagnosis.

Preoperative Evaluation of the Patient.—Complete evaluation of the patient prior to operation is usually essential to a successful operation and may be indispensable in the prevention of postoperative recurrences. At the time of admission to the hospital, the patient should be given a diet containing 600 to 700 mg. of calcium daily for at least three days. Even in normal persons there appears to be considerable individual variation in the intestinal absorption of calcium;[14] hence, a diet containing 10 mg. of calcium per kilogram of body weight affords a more satisfactory physiologic test than one with a minimal calcium content. During the period in which the patient is taking this diet, the following preliminary studies may be completed.

Examination of the Urine: Bacteriologic culture of the urine should be made at once for identification of the infecting organisms, with determination of their urea-splitting properties and *in vitro* sensitivity to the various antibiotic and chemotherapeutic agents. The responsible physician should participate in a daily examination of the urine, including tests for Bence-Jones protein and determination of the hydrogen ion concentration (*p*H). The diagnostic potentialities of adequate examination of the urine have been summarized by Lippman[15] and should be fully utilized in the evaluation of patients with calculous disease.

Studies of Renal Function: The Fishberg concentration test, with determination of the *p*H of each specimen, provides a valuable estimate of renal function. The value of determining the phenolsulfonphthalein excretion and the blood urea nitrogen content is well recognized, but the limitations of these tests should be appreciated.[16] Differential studies of renal function are essential to the management of patients with advanced bilateral renal disease.

The anatomic configuration of the urinary tract should be clearly delineated by excretion pyelographic, cystoscopic and retrograde pyeloureterographic study. It may not be advisable or necessary to employ all of these technics to every patient, but the surgeon should be aware of the presence of urinary obstruction, congenital anomalies or other anatomic deviations that may affect the plan of the operative procedure.

Supplemental Examinations: Roentgenograms of the chest, evaluation of the cardiovascular reserve, and more specific laboratory or roentgenologic evaluation of abnormal symptoms or signs should be completed during the three days in which the patient is on a measured calcium intake.

After three days of measured calcium intake, the following examinations should be made:

Biochemical Studies of the Blood: The serum concentration of calcium, inorganic phosphorus, total protein, albumin, globulin and alkaline phosphatase should be determined on the morning of the fourth day after initiation of the special diet. The plasma chloride content and the carbon dioxide combining power are determined at this time if the previous examination has indicated a disturbance of anion-cation balance or the presence of advanced renal disease.

The serum calcium determination is best interpreted in terms of protein-bound and ionizable calcium, since the latter is the more important factor in diseases associated with renal lithiasis. The original investigations of McLean and Hastings[17] drew attention to this distinction, but their "normogram" was difficult to commit to memory and did not take into consideration the variations in the individual components of serum proteins. In 1937[18] the Gutmans introduced the basic studies for their equation[19] which we have found the most satisfactory method of calculating the ionizable calcium fraction of serum. We refer to these constants as the "Gutman factors," and the equation is expressed as follows:

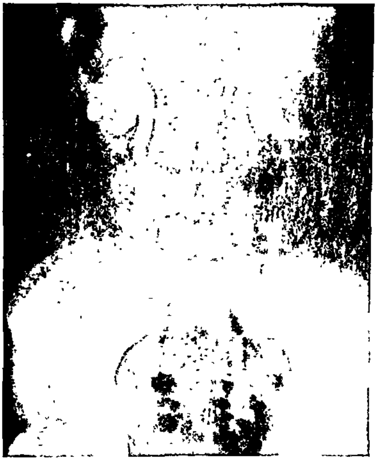


Fig. 1.—Bilateral renal calculi. Plain (KUB) roentgenogram to illustrate type of calculi amenable to extended pyelotomy (see Fig. 2*D*).

$$\text{Total serum calcium} = 0.83 \text{ albumin} + 0.2 \text{ ``globulin I''} + 1.0\ (\pm 0.5) + 5.8\ (\pm 0.2)$$

The total calcium content is expressed in milligrams per hundred grams of serum water, and the factor 0.83 represents the number of milligrams of calcium bound per gram of albumin. The quantity 0.2 is a constant, representing the number of milligrams of calcium bound per gram of globulin when the total globulin level exceeds 3 Gm. per hundred grams of serum water. The constant 1.0 (±0.5) represents, in milligrams per hundred grams of serum, the amount of calcium that is bound to the alpha and beta globulins. The quantity 5.8 (±0.2) represents the "normal" quantity of free or ionizable serum calcium. In our own experience, this equation conforms to the total serum calcium content within a range of ±0.7 mg. of calcium per hundred grams of serum in a large number of normal subjects. In every case in which the total serum calcium content, as determined in the laboratory, did not conform to the quantity anticipated from the aforedescribed calculations, we have discovered that the patient had hyperparathyroidism, multiple myeloma or other disease associated with an abnormality of calcium metabolism.

Examination of the Twenty-Four-Hour Urine Specimens: Beginning on the morning of the fourth day after initiation of the standard calcium diet, twenty-four-hour urine collections are made into sterile containers, which are kept in bedside ice chests. For patients with active infection of the urinary tract the addition of 4 ml. of chloroform will serve as an additional preservative. Examination of the centrifuged sediment and determination of the protein content are made on representative samples of the specimen. The most important test is the one for determining the twenty-four hour excretion of calcium. We have found the titration method[20] relatively easy to perform, giving duplicate results within a standard deviation of 2 mg. of calcium per twenty-four hour specimen of urine.

It is our opinion that the Sulkowitz test should be abandoned as a clinical procedure. It is true that a 3 plus or a 4 plus reaction may be significant, but the procedure is unreliable as a "screening test" because of the high percentage of "false negative" results. Application of the Sulkowitz test to single voided specimens of urine has given false negative results in more than 60 per cent of cases in which the twenty-four hour urinary excretion of calcium was determined chemically to be between 200 and 340 mg.

The test is scarcely more reliable when applied to twenty-four hour specimens of urine, since a negative result means nothing in the presence of an increased output of urine. In 4 patients with multiple myeloma and 3 with hyperparathyroidism whose urinary excretion of calcium was two or more times the normal, we observed also a consistent increase in the total volume of urine. The average volume of urine for this group in twenty-four hours was 2,800 ml., the maximum being 3,200 ml. In every case, the result of the Sulkowitz test of the patient's twenty-four hour specimen was equal to, or less than, that for the normal control (150 mg. of calcium per 1,200 milliliters of urine), an observation that is readily understandable when one considers that even a significant increase in urinary calcium is rarely more than twice the normal, whereas the volume of urine in these patients was more than two to three times the normal. Furthermore, the presence of an excess of magnesium ions will completely invalidate the result of the Sulkowitz test, even when there is a marked increase in the unit volume concentration of calcium.[21]

Preoperative Preparation.—Urologists familiar with the treatment of azotemic patients with prostatic disease will readily appreciate the advantages to be derived from preoperative preparation of the patient with bilateral renal calculi and impairment of renal function. Not infrequently such preparation requires several weeks, or even months, of outpatient management.

Control of Infection: Infection commonly accompanies large calculi. Although it is rarely possible to "sterilize" the urinary tract permanently, adequate preoperative treatment can reduce bacterial invasion of the kidney and the number of virulent organisms in the urine to a minimum.[22] Antibiotic or chemotherapeutic regimens should be based on the results of urine cultures, *in vitro* sensitivity tests and studies of the kidneys' functional capacity. The patient should be examined at regular intervals and the therapeutic rou-

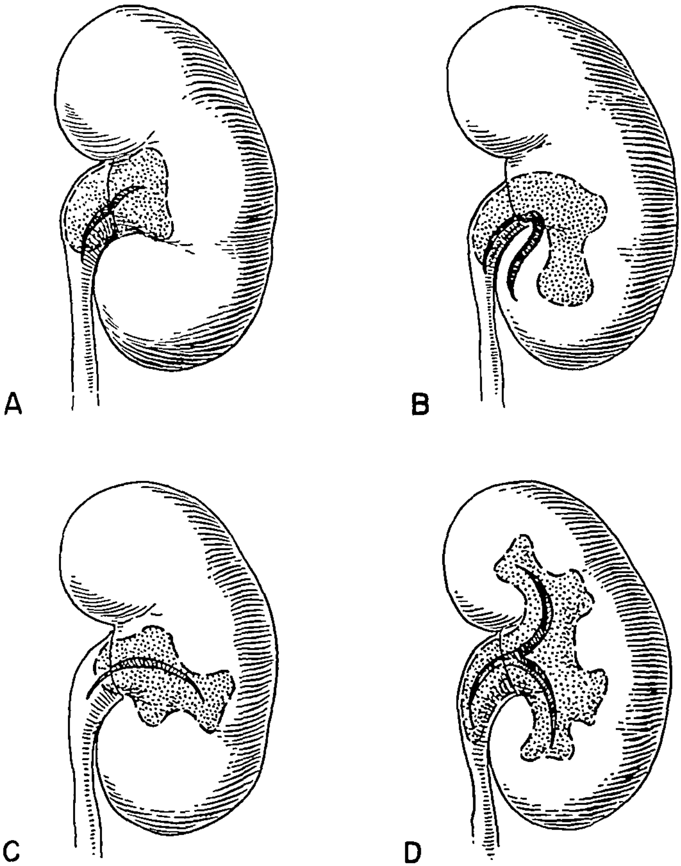


Fig. 2.—Modifications of pyelotomy; right kidney, posterior aspect. *A*, conventional pyelotomy into extra-renal pelvis. The hilar renal parenchyma is retracted laterally. *B*, extension of pyelotomy to expose lowest calyx. *C*, extension of pyelotomy into middle calyx. *D*, pyelotomy combined with "V" type nephrotomy of Prather.

tine adjusted in accordance with his clinical progress.[23]

Control of Anemia: Anemia and hypoproteinemia frequently accompany chronic renal infection or mechanical impairment of renal function. These conditions may not be apparent in the rountine blood cell count and serum protein determination, since these tests give no indication of changes in blood volume. The sedimentation rate and hematocrit reading (Wintrobe indexes) are more accurate indexes to the inflammatory process and the degree of anemia. Determination of the blood volume is particularly useful in the evaluation of the patient.

The anemic patient should be studied for extrarenal causes of anemia before transfusions of whole blood are administered. Anemia due to chronic infection of the urinary tract is not always associated with an elevation in the blood urea nitrogen content and will often respond to combined antibacterial and dietary routines. If the anemia must be corrected by transfusions, these should be administered prior to surgical intervention.

Surgical Management: In addition to the technical details and surgical principles that are now well established,[24] certain fundamentals in the care of the patient deserve particular emphasis.

Decision as to the optimum time for operation must be based largely on clinical judgment. This implies evaluation of the improvement in renal function and general health as opposed to the impairment of renal function and the recurrence of calculi. The growth of renal calculi is intermittent, and it is usual for patients to reach a stage in which calculi cease to increase in size and no new ones are formed. Theoretically, this is the optimum time to remove all calculi from the urinary tract, but as yet there are no exact methods of determining when the patient has passed the "stone-forming stage."

Management of bilateral calculi poses the problem as to which kidney should be operated on first. The decision is often based on the results of differential renal function studies or upon evidence of progressive dilatation of the collecting system in one kidney. In patients with unilateral progressive hydronephrosis the enlarged kidney should usually be operated on first. The principle of "renal counterbalance," as defined by Hinman, is one which our clinical observations have repeatedly shown to be important. In the presence of bilateral impairment of renal function, the more severely damaged kidney should be operated on first, in the expectation that its function will subsequently improve. When one kidney is markedly damaged and the other functions normally or with only slight impairment, the latter is operated on first. Under these circumstances, the slightly damaged kidney may regain normal function after the operation, and the seriously damaged kidney may undergo progressive loss of function to the point at which nephrectomy is indicated at the time of the second operation. Repeated differential function tests are essential in planning the care of these patients.

Technical Considerations as to Specific Operative Procedures: The essentials of successful operation include the removal of all calculi and the complete relief of stasis within the urinary tract. Roentgenograms taken during the operation will insure removal of the calculi, and complete preoperative study of the urinary tract will aid in planning the measures required for relief of stasis. Since the Bucky diaphragm cannot be used, a small (10 by 15 cm.) cassette that can be placed inside the incision adjacent to the kidney has many advantages over the cassette of regulation size, which requires the roentgen exposure to be made through the entire thickness of the body.

Pyelolithotomy (Figs. 1 and 2): The many modifications of this procedure include extensions of the pyelotomy into the major calyces and renal parenchyma.[25] Pyelotomy may be so planned as to remove a calculus and simultaneously relieve a ureteropelvic or ureteral obstruction. It should be utilized in preference to nephrotomy whenever possible, and the complete removal of all fragments of calculi and cellular débris may be accomplished by copious irrigation with saline solution through soft rubber tubes. In selected cases, functioning renal tissue may be conserved by the use of coagulum pelviolithotomy.[26]

To effect an anatomically normal reconstruction of the pelvis, the pyelotomy incision is closed with interrupted sutures of fine catgut placed through the muscularis. Intrapelvic drainage by pyelotomy tube is rarely necessary and should be reserved for kidneys in which there is marked dilatation of all the calyces, with infection by organisms resistant to antibiotic and chemotherapeutic agents. Extrarenal drainage with rubber tissue is adequate for the majority of patients.

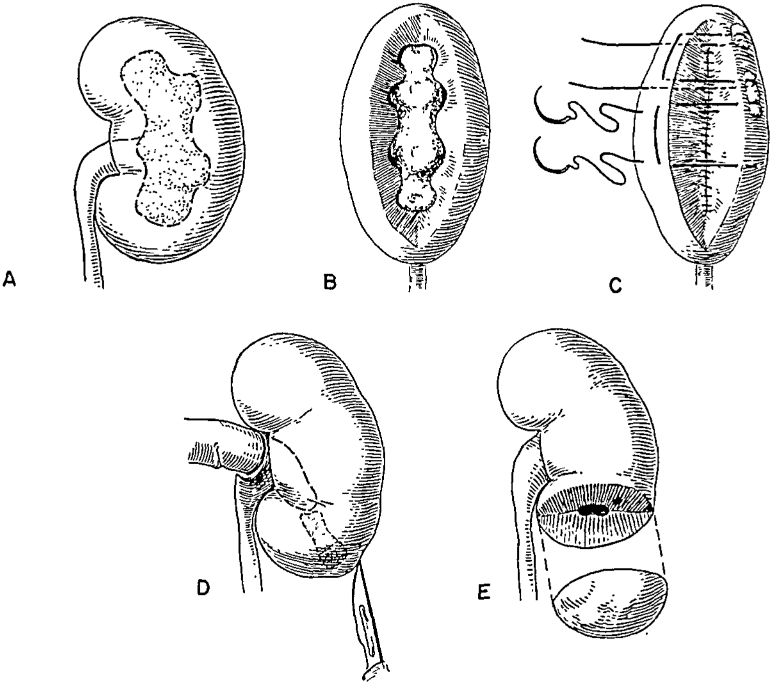


Fig. 3.—Nephrotomy for removal of calculi, right kidney. *A*, intrarenal pelvis with large calculus. *B*, complete nephrotomy with calculus exposed. *C*, pelvis reapproximated and two parenchymal sutures placed in position after Vest-Barelare technic. *D*, nephrotomy limited to single calyx in conjunction with pyelotomy. *E*, incision for calysectomy. Renal capsule (not illustrated) is stripped from excised portion of kidney and remains attached to organ, where it is used in final closure of nephrotomy.

Nephrolithotomy (Fig. 3): Incisions into the renal parenchyma are avoided whenever possible, in order to preserve functioning renal tissue. When the calculus cannot be completely removed by any other method, however, we do not hesitate to do as extensive a nephrotomy as may be required. A limited nephrotomy over a single calyx may be particularly useful in conjunction with a pyelotomy. Sutherland[27] has emphasized the necessity for relief of stasis resulting from a markedly narrowed infundibulum.

The usual indication for complete nephrotomy is the presence of a large calculus within an intrarenal pelvis (Fig. 4). The incision is made along the convex surface of the kidney from the superior to the inferior calyces. Bleeding is controlled by a rubber tourniquet placed about the renal pedicle and released at intervals of ten minutes. The larger severed vessels are occluded with suture ligatures of No. 0000 catgut. The calyces and intermediate portions of the pelvis are incised, and the entire calculus is removed. The incision in the pelvis and calyces is carefully reapproximated with a continuous No. 0000 plain catgut suture, which may be tied or locked at intervals to prevent a purse-string effect. The nephrotomy may be closed with the minimum number of vertical mattress sutures required to control bleeding. We have successfully employed the elastic tension sutures of Vest and Barelare[28] and consider them preferable to the conventional mattress sutures (Fig. 3*B*). No intrarenal drainage is employed, because the introduction of tubes through a nephrotomy incision may contribute to persistent infection or secondary hemorrhage.

Calysectomy (Fig. 3*D*): Patients in whom one or two calyces are dilated to

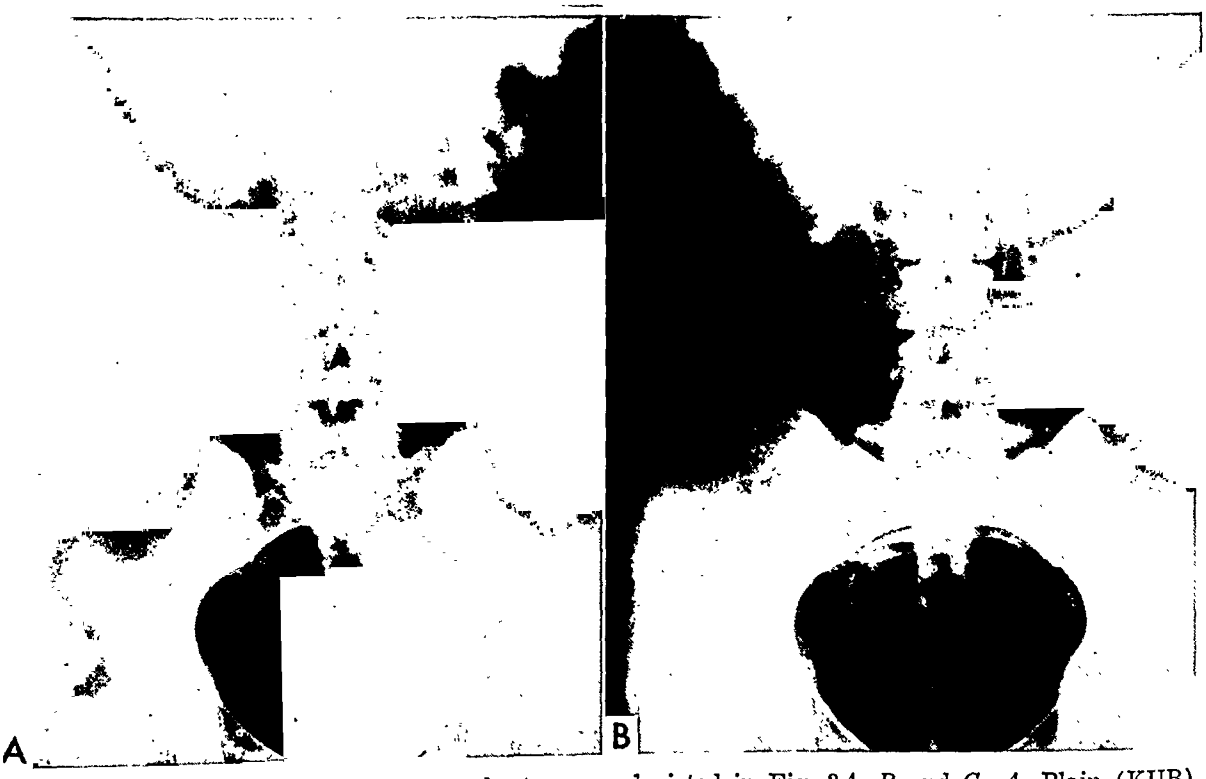


Fig. 4.—Renal calculus removed by nephrotomy as depicted in Fig. 3*A*, *B* and *C*. *A*, Plain (KUB) roentgenogram to illustrate size and position of calculus. *B*, excretory urogram taken nine months after the operation, ten minutes after injection of contrast material. Note normal anatomic configuration of renal calyces and pelvis. Calculus has not recurred two years after operation.

such an extent that postoperative stasis of urine may be expected should be treated by calysectomy or heminephrectomy.[29] The technic is essentially the same as that described for nephrotomy incision and repair.

Postoperative Medical Management and Prevention of Recurrent Calculi.—Eradication of Infection: Active antibacterial therapy begun prior to operation must be continued relentlessly in the postoperative period. Repeated cultures of the urine and sensitivity tests are made whenever the signs of urinary infection appear static. Long-term therapy utilizing mandelic acid in combination with sodium acid phosphate is particularly effective when renal function will permit acidification of the urine. Sodium acid phosphate is preferable to ammonium chloride for acidification of the urine in patients with calculous disease, since it is less likely to increase the excretion of calcium in the urine.[30] The high degree of solubility of sulfamethylthiadiazole has prompted us to add this drug to the mandelic acid and sodium acid phosphate routine in selected cases. This combination has proved effective in the treatment of a small number of chronic urinary infections due to *Bacillus Pseudomonas, Proteus rettgeri* or *Proteus mirabilis* after other forms of antibiotic and chemotherapeutic measures have failed.

Analysis of the Calculus: Analysis of the calculus by a competent laboratory is indispensable to the planning of a successful therapeutic routine. At the present stage of our knowledge, the qualitative chemical analysis[31] is entirely suitable. This method has the advantage of employing technics that are familiar to qualified laboratory technicians, and of requiring only reagents and apparatus that are available in any well stocked laboratory. We have employed the spectrophotometer to determine the metal content of more than 500 calculi in our laboratory, but neither this instrument nor the roentgen ray diffraction technic[32] appears to provide any therapeutic applications that are not also inherent in chemical analysis.

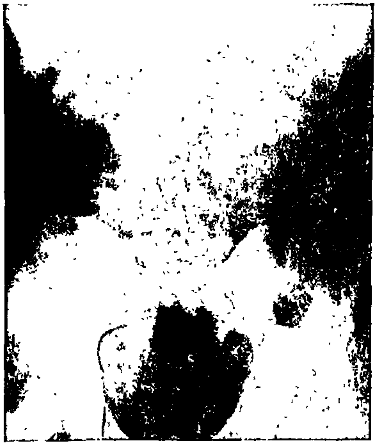


Fig. 5.—Nephrocalcinosis as a result of congenital renal tubular acidosis. Plain (KUB) roentgenogram to illustrate intrarenal calcinosis.

Dietary Management: Dietary management is designed to reduce the quantity and increase the solubility of the stone-forming crystalloid components of urine. The success of the program is closely related to the patient's comprehension of the objectives and, hence, to the physician's capacity for lucid explanation. It should be emphasized that the maintenance of a continuing maximal flow of urine is the most effective single measure for reducing crystalloid concentration per unit volume of urine. It is also essential to guard against deficiency states that may be created in the dietary program, and supplemental vitamin therapy, other than vitamin D, should be continued postoperatively.

Cystine Calculi: The most important

principle in the management of cystine calculi is the maintenance of a persistently alkaline urine with a *p*H of 7.6 to 8. In our experience an alkaline ash diet, supplemented with 20 to 60 cc. of disodium citrate administered midway between meals and before bedtime, gives the most nearly uniform alkalinization of the urine with the lowest incidence of undesirable side effects. The dosage of disodium citrate is regulated by the patient on the basis of determinations of the urinary *p*H, made with nitrazine test paper before each meal. If the first urine specimen in the morning is acid, it may be necessary for the patient to take a dose of the citrate at 2 a.m. We have not found it necessary to utilize diets low in cystine with administration of choline[33] in any of our cases.

Uric Acid Calculi: In the absence of clinical evidence of gout, the patient who is subject to uric acid calculi can be given an alkaline ash diet, combined with a relatively low purine intake, to provide a palatable and effective therapeutic routine. The addition of alkalinizing agents to this diet will rarely be necessary, but they may be employed in the manner outlined for patients with cystine calculi. It should be remembered that the treatment of gout by the usual medical regimens may increase the urinary excretion of uric acid, and these patients should establish a maximal urine volume flow and maintain urinary alkalinity with disodium citrate, if necessary.

Calcium Phosphate Calculi: The majority of patients with "malignant" calculous disease have this type of stone. Included in this category are stones composed of calcium phosphate alone and those composed of calcium phosphate in combination with magnesium ammonium phosphate or small quantities of calcium oxalate. The precipitation of magnesium ammonium phosphate is controlled by removal of the "primary" stone, which provides an area for "surface crystallization," and by elimination of urea-splitting organisms from the urinary tract.

Our dietary program for these patients is directed toward the reduction of urinary calcium excretion.[34] This program was instituted in January 1953, with a low-calcium, low-oxalate, low-vitamin D, high phytic acid diet. The diet provides 300 mg. of calcium per twenty-four hours, 80 Gm. of protein, 250 Gm. of carbohydrate and 100 Gm. of fat, for a total caloric intake of 2,200 calories and an approximate phosphorus intake of 1,200 mg. The phytic acid is provided in the form of oatmeal, whole grain cereals and brown bread.[35] Phytic acid forms an insoluble complex with calcium ions within the bowel, thus reducing the quantity absorbed and, hence, the quantity excreted in the urine.[36] In 8 patients, by utilization of this diet alone, we have been able to maintain a reduction in the urinary excretion of calcium 30 to 50 per cent less than the pre-treatment levels for thirty-three months without evidence of adverse effects. More recently, phytate in pure form as the sodium salt of inositol* has been added to the routine. The daily dosage of 100 to 125 mg. per kilogram of body weight is administered in three divided doses. Each dose is measured from a 10 per cent or 12.5 per cent stock solution into a large glass of water and is taken slowly during each meal.

Bronner and Harris[37] have demonstrated by use of Calcium isotopic tracer studies that the addition of the sodium salt of inositol to the diet was more effective in reducing the urinary excretion of calcium than was phytate supplied by cereals alone. Henneman and Carroll[38] have reported a 28 to 97 per cent reduction in the urinary calcium excretion of patients with sarcoidosis who were given 9 Gm. of sodium

---

*Provided through the courtesy of Dr. Douglas B. Remsen, E. R. Squibb & Sons, Division of Mathieson Chemical Corporation, The Squibb Institute for Medical Research, New Brunswick, New Jersey.

		Idiopathic (Normal Values)	Primary Hyperparathyroidism	Milk-Alkali (Burnett's) Syndrome	Multiple Myeloma	Renal Tubular Acidosis	Renal Rickets	Acute (Immobilization) Osteoporosis	Hypervitaminosis-D	Sarcoidosis (Boeck's)	Paget's Disease (Osteitis Deformans)	Malignant Osseous Metastasis	Cystine Metabolism
SERUM	Calcium	8 5-11 5 mg /100ml	↑ ∞ 22	↑	↑	N-↓	↓	↑	↑	↑	N	N-↑	N
	Phosphorus	3 0-4 5 mg /100ml	↓	N	N	N-↓	N-↑	N	↑	N	N-↑	N-↑	N
	Total Protein	6-8 Gm/100gm	N	N	↑	N-↓	N-↓	N	N	↑	N	N-↓	N-↓ Liver Disease
	Albumin	4 0-5 2 Gm/100gm	N	N	N-↓	N-↓	N-↓	N	N	N-↓	N	N-↓	N-↓ Liver Disease
	Globulin	2 0-3.2 Gm/100gm	N	N	↑	N	N	N	N	↑	N	N-↓	N
	Alkaline Phosphatase	2-4 5 Adults <14 Infants Bodansky Units	↑ ∞ 20-30	N	N	N	N	N	N	↑	↑	N	N-↑ Liver Disease
	Bicarbonate	24-31 mEq/l	N	↑	N	↓	↓	N	N	N	N	N	N
	Chloride	97-108 mEq/l	N	↓	N	↑	↑	N	N	N	N	N	N
	Sodium	132-152 mEq/l	N	N	N	↓	N-↓	N	N	N	N	N	N
	Potassium	3 6-5 3 mEq/l	N	N	N	↓	N-↓	N	N	N	N	N	N
	Blood Urea Nitrogen	8-23 mg /100ml	N	↑	N	N	↑	N	N	N	N	N	N
URINE	pH	4 5—8 0	<6 8	6 8>	N	6 8>	6 8	N	N	N	N	N	<6 8
	Calcium	<150 mg / 24 hours	200-1,000	N	N-↑	↑	N	↑	N-↑	N-↑	N-↑	N-↑	N
	Specific Gravity	1 014—1 026	N	1 010	N	N-1 010	1 010	N	N	N	N	N	N
	Special Tests	Sediment Exam			Bence-Jones	Acid Load (NH_4CL)							Cystine Crystals
ROENTGENOGRAPHY			Generalized Bone Disease	Multiple Calcinosis	Localized Osteolytic	Nephro Calcinosis	Generalized Bone Disease	Local Repair-(General Osteoporosis)	Multiple Calcinosis	Hands and Feet	Osteolytic Osteoplastic and Normal Bone	Localized Lesions	Radio-paque Calculi
DIAGNOSTIC TESTS			Barium Swallow Fluroscopy	History	Electrophoresis of Serum Myeloma Cells in Blood and Marrow	Acid Loading (NH_4CL)	Renal Function Tests	History	History	Skin Lesions Lymph Node Biopsy	Bowing of Extremities	History	Family History

N = Normal; ↑ = Increased; ↓ = Decreased, < = Less than; > = More than, ∞ = As much as

phytate per twenty-four hours, in divided doses.

The effectiveness of this form of therapy in the prevention of recurren calcigerous stones remains to be eval by prolonged trial in nt n of patients to justify conclusions.

Calcium Oxalate Calculi: The patient is given the same diet as described for the treatment of calcium phosphate calculi. This is supplemented by magnesium citrate solution (U.S.P.) administered in doses of 16 to 30 cc. prior to each meal. The dosage is increased until examination of the urinary sediment reveals no calcium oxalate crystals or until a cathartic effect is obtained. The rationale for administering magnesium is the observation that oxalic acid forms chelate compounds with calcium and magnesium. The stability constant of magnesium oxalate is 3.4 log K Δ, while that of calcium oxalate is 3.0 log K Δ.[39] In a simple ionic system, magnesium will thus be bound by oxalic acid in preference to calcium, although how well this will hold true in a complicated system, such as the urine, remains unknown. The 150 mg. of magnesium in a twenty-four hour specimen of normal urine is more than thirty times the quantity required to bind the 20 mg. of oxalic acid normally present, but there are no data available to indicate whether this quantitative relation exists in the urine of patients with oxalate calculi.[40] Since magnesium oxalate has not been described as a component of urinary calculi, it seems logical to provide an excess of magnesium ions in the urine of these patients. Hammarsten[41] and Prien[42] observed that diets deficient in magnesium resulted in the formation of calcium oxalate calculi in rats and that the addition of magnesium to the diet prevented the formation of these concretions.

Nephrocalcinosis (Fig. 5): The patient with this condition should never be subjected to pyelolithotomy unless it is designed to remove an obstructing intrapelvic calculus, and even then no attempt should be made to remove the intrarenal calcification. It is important to establish the underlying pathologic cause of this symptom before initiating any therapeutic routine. Hyperparathyroidism should be excluded by repeated diagnostic studies as described above.

The patient is placed on the dietary routine described for calcium phosphate calculi. The urinary infection is treated vigorously, and the majority of our patients with nephrocalcinosis have had infections with staphylococci. Some of these patients have been observed to pass small calcium oxalate calculi, and these have received magnesium citrate in addition to the above routine. Both magnesium citrate and disodium citrate will supply additional cations for urinary excretion and aid in reducing the hyperchloremia, which is usually present. It is most important that the patient with renal tubular acidosis avoid an acid ash diet, or any supplemental acidifying routine which will impose additional demands on the patient's supply of cations for urinary excretion and may increase the calcium absorption from the bowel.[43]

COMMENT

The basic mechanism involved in the formation of calculi remains unknown. It has not been established that it is physiologically possible to maintain a level of ionizable calcium in the urine so low that calculus formation cannot occur. There is considerable evidence that urinary calcium concentration *per se* may not be the primary factor in the initiation of calculus formation. It seems likely that surface crystallization or "secondary" calculus formation plays a part in the growth of calculi, but crystallization of urinary salts alone can result only in pulverulent or granular solids of self-limited size.

We have studied the structure of more than 500 urinary calculi by dissolution of the crystalline components with solubilizing metal chelate agents.[44] No calcigerous stone, regardless of size or chemical composition, has been found to be a pure crystalline structure. An organic framework has been found from center to surface in every calculus in this series. When the crystalline material is solubilized by simple diffusion of the chelating agent through the calculus, the intact organic framework remains as a perfect cast of the original stone. This framework is filamentous in character and quite dense, with interstices that are usually microscopic in size. The crystalline components of calculi occupy these interstices. Obviously, the factors which influence crystal formation in the urine play a part in the filling of these interstices, but it would appear that no calcigerous stone can be formed in the absence of this organic framework.

The organic matrix thus assumes an important role in the initiation and growth of calculi. Until some method has been found for the *in vivo* dissolution or inactivation of those molecules which form the framework of calculi, one cannot hope for complete success in the currently proposed routines for the prevention of calculus formation. In the meantime, such failures should not deter one from utilizing every method available for increasing the solubility and reducing the concentration of stone-forming crystalloids in the urine of those patients who have a predisposition to recurrent calculus formation.

SUMMARY

The presence of a calculus within the urinary tract should be considered a symptom rather than a primary disease state. In the majority of cases, calculous disease must be classified as "idiopathic," since the causative factors are as yet unknown. Certain diseases are associated with an increased incidence of renal calculi, and, although these account for only a small proportion of the total number, it is important to recognize them when they exist.

The patient with calculous disease should not be subjected to lithotomy until all possible etiologic factors, the patient's renal function and the anatomic aspects of his urinary tract have been thoroughly evaluated. The morbidity and mortality associated with the operative procedure can be greatly reduced by correct preoperative preparation of the patient. Recurrent calculus formation can be reduced by a carefully planned operation designed to remove all of the calculus, relieve urinary obstruction and preserve functional renal tissue. The postoperative management of the patient is a continuing responsibility of the urologist and should include every measure that may help to preserve renal function and prevent recurrent calculus formation.

RIASSUNTO

La presenza di un calcolo nel tratto urinario dovrebbe essere considerato un sintomo pouttosto che una malattia. Nella maggior parte dei casi bisogna classificare la malattia calcolosa come "idiopatica" dato che i fattori che la causano sono finora sconosciuti. Certe affezioni sono associate ad una aumentata frequenza di calcoli renali e, benchè questi occupino solo una piccola parte del numero totale, è importante riconoscerli quando sonto presenti. Il paziente affetto da malattia calcolosa non dovrebbe essere sottoposto alla litotomia almeno fino a che i possibili fattori etiologici, la funzionalità renale del paziente e gli aspetti anatomici del suo tratto urinario non siano stati accuratamente vagliati. La morbilità e la mortalità secondarie all'intervento possono essere ridotte al minimo con un accurato preparazione del paziente; la recidiva può essere ridotta da un intervento accurato che abbia allontanato tutti i calcoli, eliminato gli ostacoli e risparmiato il tessuto renale funzionante. La cura post-operatoria è nelle mani dell'urologo e abbraccia

ogni tentativo per conservare la funzione renale e prevenire una nuova formazione di calcoli.

ZUSAMMENFASSUNG

Das Auftreten einer Steinbildung in den Harnwegen sollte als ein Symptom und nicht als ein primärer Krankheitszustand angesehen werden. Da die ursächlichen Faktoren der Steinbildung noch unbekannt sind, muss die Mehrzahl der Fälle von Steinerkrankungen als "idiopathisch" klassifiziert werden, Gewisse Krankheiten gehen mit gehäuftem Auftreten von Nierensteinen einher, und wenn auch diese Erkrankungen nur für einen geringen Anteil der Gesamtzahl von Nierensteinen verantwortlich sind, so ist doch ihre Erkennung, wenn sie vorliegen, wichtig.

Kein Patient mit Harnsteinerkrankung sollte einer chirurgischen Entfernung des Steines unterzogen werden, bevor alle möglichen ursächlichen Faktoren, die Nierenfunktion des Kranken und die anatomischen Bedingungen seines Harnsystems sorgfältig geprüft worden sind.

Die mit operativen Eingriffen einhergehende Morbidität und Sterblichkeit kann durch richtige Vorbereitung zur Operation erheblich herabgesetzt werden. Das Wiederauftreten von Steinbildungen lässt sich vermindern, wenn die Operation sorgfältig geplant wird mit dem Ziel, die gesamte Steinbildung zu entfernen, Verstopfung der Harnwege zu beseitigen und funktionstüchtiges Nierengewebe zu erhalten. Die Verantwortung des Urologen erstreckt sich auch auf die Behandlung nach der Operation, wozu alle Massnahmen gehören, die zur Erhaltung der Nierenfunktion und zur Vorbeugung neuer Steinbildungen beitragen.

SUMARIO

A presença de um cálculo dentro do trato urinário poderia ser considerado antes um sintoma que um estado primário da doença. A maioria dos casos de calculose deve ser classificado como "idiopático," desde que os fatores que o ocasionam sejam ainda desconhecidos.

Algumas enfermidades são associadas com um aumento da incidência do cálculo renal, e ainda que isto aconteça em uma diminuta proporção de casos, é importante reconhece-las quando existem. O doente com calculose não seria submetido a litomia até que todos os possiveis fatores etiólógicos, a função renal do paciente e os aspectos anatômicos de seu trato urinário tenham sido totalmente avaliados.

A morbidade e mortalidade associados ao progresso operatório podem ser grandemente reduzidos por uma correta preparação pré-operatória do paciente. Formações recorrentes de cálculos podem ser reduzidas por uma cuidadosa operação destinada a remover todos os cálculos, avaliar a obstrução urinária e preservar o tecido de função renal. O cuidadoso post- operatório do doente é uma responsabilidade constante do urologista e incluiria as medidas que podem ajudar a preservar a função renal e prevenir as recorrentes formações de cálculos.

RÉSUMÉ

La présence d'un calcul dans le trait urinaire doit être consideree plutôt comme symptôme, qu'une maladie primaire. Dans la plupart des cas la maladie calculeuse doit être classifiée comme "idopathique," puisque les facteurs causaux ne sont pas encore connus. Certaines maladies sont associées à une plus grande incidence de calculs rénaux, et malgré que ces maladies causent seulement une petite proportion du chiffre total, il est important de les reconnaitre, s'ils existent. Le malade qui est atteint d'une maladie calculeuse, ne doit pas être sujet à la lithotomie, avant que touts les facteurs possiblement étiologiques, la fonction rénale du malade et les

aspects anatomiques de son trait urinaire soient évalués complètement. On peut reduire considerablement la morbidite et mortalité associée à la procédure operatoire par une bonne préparation préopératoire du patient. La formation de nouveaux calculs peut être reduite par une opération, qui est préparée avec soin, pour enlever touts les calculs, lever les obstructions urinaires, et conserver du tissu rénal fonctionnant. Le soin postopératoire du malade impose une responsabilité continue à l'urologue et doit contenir touts les moyens possibles de conserver la fonction rénale et prévenir des récidives de la formation de calculs.

REFERENCES

1. Biggs, A. W., and Norfleet, C. M. Jr.: Renal Calculi: An Analysis of 300 Cases, Proc. Southeastern Section Am. Urol. Assoc., 1955.

2. Albright, F.; Baird, P. C.; Cope, O., and Bloomberg, E.: Studies on the Physiology of the Parathyroid Glands, IV. Renal Complications of Hyperparathyroidism, Am. J. M. Sci. 187:49, 1934. Cope, O.: Hyperparathyroidism, J. Missouri M. A. 39:273, 1942.

3. Albright, F., and Reifenstein, E. D. Jr.: The Parathyroid Glands and Metabolic Bone Disease. Baltimore: The Williams and Wilkins Company, 1948. Paschkis, K. E.; Rakoff, A. E., and Cantarow, A.: Clinical Endocrinology. New York: Paul B. Hoeber, Inc., 1954, Chap. 31. Castleman, B., and Mallory, T. B.: The Pathology of the Parathyroid Gland in Hyperparathyroidism, Am. J. Path. 11:1, 1935.

4. Mulholland, H. B.: Hypercalcemia with Renal Insufficiency, Trans. Am. Clin. & Climatol. Assoc. 4:1, 1952.

5. Burnett, C. H.; Commons, R. R.; Albright, F., and Howard, J. E.: Hypercalcemia Without Hypercalcuria or Hypophosphatemia, Calcinosis and Renal Insufficiency, New England J. Med. 240:787, 1949.

6. Carpenter, H. M., and Pautler, E. E.: Hyperparathyroidism wi[illegible] of a Case Confuse[illegible] New England J. M[illegible] Differentiation of [illegible] Alkali (Burnett) [illegible] Med. 251:1035, 1954. Mulholland.4

7. Kessler, E.: Hypercalcemia and Renal Insufficiency Secondary to Excessive Milk and Alkali Intake, Ann. Int. Med. 42:324, 1955.

8. Hayes, D. W.; Bennett, W. A., and Heck, R. J.: Extramedullary Lesions in Multiple Myeloma: Review of the Literature and Pathologic Studies, Arch. Path. 53:262, 1952.

9. Farrell R. H.: Hyperchloremic Renal Acidosis of Infants (Nephrocalcinosis Infantum): Report of a Case and Review of Literature, Guy's Hosp. Reports 102:234, 1953.

10. Mortenson, J. D., and Baggenstose, A. H.: Nephrocalcinosis: A Review, Am. J. Clin. Path. 24:45, 1954.

11. Flocks, R. H.: The Preventive Treatment of Calcium-Urolithiasis. Philadelphia: The J. B. Lippincott Company, 1944. Clinics, vol. 3, no. 1, p. 103.

12. Davidson, C. N.; Dennis, J. M.; McNinch, E. R.; Wilson, J. K. V, and Brown, W. H.: Nephrocalcinosis Associated with Sarcoidosis, Radiology 62:203, 1954. Dent, C. E.; Flynn, F. V., and Nabarro, J. D. N.: Hypercalcemia and Impairment of Renal Function in Generalized Sarcoidosis, Brit. M. J. 2:808, 1953. Klatskin, G., and Gordon, M.: Renal Complications of Sarcoidosis and Their Relationshi[illegible] Report of Two Cases [illegible] roidism, Am. J. Med. 1[illegible]

13. Reifenstein, E. C., and Albright, F.: Paget's Disease: Its Pathologic Physiology and Importance in the Complications Arising from Fracture and Immobilization, New England J. Med. 231:343, 1944.

14. McCance, R. A.: The Problem of Adaptation to Low Calcium Intakes, Metabolic Interrelations. New York: Josiah Macy Jr. Foundation, 1954, p. 166.

15. Lippman, R. W.: Urine and the Urinary Sediment: A Practical Manual and Atlas. Springfield, Ill.: Charles C Thomas, Publisher, 1952.

16. Mitchell, A. D.; Owens, R., and Valk, W. L.: Clinical Value of Urea Clearance and Phenolsulfonphthalein Test, J. Urol. 71:230, 1954.

17. McLean, F. C., and Hastings, B.: The State of Calcium in the Fluids of the Body. I. The Conditions Affecting the Ionization of Calcium, J. Biol. Chem. 108:285, 1935.

18. Gutman, A. B., and Gutman, E. B.: Relation of the Serum Calcium to Serum Albumin and Globulins, J. Clin. Invest. 16:903, 1937.

19. Gutman, A. B.: The Transport of Calcium in Plasma, Metabolic Interrelations, Trans. New York: Josiah Macy Jr. Foundation, 1954, p. 262.

20. Shohl, A. T., and Pedley, F. G.: A Rapid and Accurate Method for Calcium in Urine, J. Biol. Chem. 50:537, 1922.

21. Hammarsten, G.: Dietetic Treatment of Calculi, Nord, Med. 31:1567, 1946.

22. Carroll, G., and Brennan, R. V.: The Urea-Splitting Organisms in the Formation of Urinary Calculi, J. Internat. Coll. Surgeons 17:809, 1952.

23. Kass, E. H.: Chemotherapeutic and Antibiotic Drugs in the Management of Infections of the Urinary Tract, Am. J. Med. 18:764, 1955.

24. Dodson, A. I.: Urological Surgery: Renal Calculi and Their Treatment. St. Louis: The C. V. Mosby Company, 1950, chap. 14. Campbell, M.: Urology. Philadelphia: The W. B. Saunders Company, 1954, vol. 3.

25. Prather, G. C.: Review of the "V" Type Nephrotomy for Staghorn Calculus with Special Reference to Final Results, Am. J. Surg. 39:589, 1938.

26. Dees, J. E.: The Use of a Fibrinogen Coagulum in Pyelolithotomy, J. Urol. 56:271, 1946. Moore, T. D., and Sweetser, T. H. Jr.: Coagulum Pelviolithotomy: [illegible] ved Te[illegible] J. Urol. 67:

579, 1952.

27. Sutherland, J. W.: Recurrence Following Operations for Upper Urinary Tract Stone, Brit. J. Urol. 26:22, 1953.

28. Barelare, B., and Vest, S. A.: The Use of Elastic Tension Sutures in Nephrotomy Wounds, J. Urol. 49:60, 1943.

29. Goldstein, A. E., and Abeshouse, B. S.: Partial Resections of the Kidney, J. Urol. 38:15, 1937. Engel, W. J.: The Late Results of Partial Nephrectomy for Calyectasis with Stone, J. Urol. 57:619, 1947.

30. Cordonnier, J. J., and Talbot, B. S.: The Effect of the Ingestion of Sodium Acid Phosphate on Urinary Calcium in Recumbency, J. Urol. 60:316, 1948.

31. Kamlet, J.: Analysis of Renal Calculi, J. Lab. & Clin. Med. 23:321, 1937. Towsky, L. W.: Qualitative Chemical Analysis of Urinary Calculi, J. Urol. 49:720, 1943.

32. Prien, E. L., and Prondel, C.: Studies in Urolithiasis: I. The Composition of Urinary Calculi, J. Urol. 57:949, 1947.

33. Langenskiold, A.: Cystinuria and Cystine Lithiasis: Influence of Choline in Cystine Excretion, Ann. chir. et gynaec. Fenniae 43:116, 1954. Abstracted in Year Book of Urology, Chicago, Year Book Publishers, 1954-1955 series.

34. Boyce, W. H., and Garvey, F. K.: Reduction of Urinary Calcium Excretion in Patients with Renal Calculi by Diets High in Phytate Content, to be published.

35. McCance, R. A., and Walsham, C. M.: The Digestibility and Absorption of the Calories, Proteins, Purines, Fat and Calcium in Wholemeal Wheaten Bread, Brit. J. Nutrition 2:26, 1948.

36. McCance, R. A., and Glaser, E. M.: The Energy Value of Oatmeal and the Digestibility and Absorption of Its Proteins, Fats and Calcium, Brit. J. Nutrition 2:221, 1948. Hoff-Jorgensen, E.; Anderson, O., and Nielson, G.: The Effect of Phytic Acid on the Absorption of Calcium and Phosphorus: III. In Children, Biochem. J. 40:555, 1946.

37. Bronner, F., and Harris, R. S.: Studies in Calcium Metabolism: Effect of Food Phytates on Calcium^{35} Uptake in Children on Low-Calcium Breakfasts, J. Nutrition 54:523, 1954.

38. Henneman, P. H., and Carroll, E. L.: The Suppression of Urinary Calcium and Magnesium Excretion by Oral Sodium Phytate. Presented at 47th annual meeting of American Society for Clinical Investigation, Atlantic City, N. J., May 2, 1955.

39. Martell, A. E., and Calvin, M.: Chemistry of the Metal Chelate Compounds. New York: Prentiss-Hall, Inc., 1952, p. 445.

40. Andrews, J. C., and Sell, Irl T.: The Properties and Interrelationship of Oxaluric and Parabanic Acids, Arch. Biochem. & Biophysics 56:405, 1955.

41. Hammarsten, G.: Dietetic Therapy in the Formation of Calcium Oxalate Calculi in the Urinary Passages: II. Skand. Arch. f. Physiol. 80:165, 1938.

42. Prien, E. L.: Studies in Urolithiasis: II. Relationships Between Pathogenesis Structure and Composition of Calculi, J. Urol. 61:821, 1949.

43. Smith, L. H. Jr., and Schreiner, G. E.: Studies on Renal Hyperchloremic Acidosis, J. Lab. and Clin. Med. 43:347, 1954.

44. Boyce, W. H.; Garvey, F. K., and Norfleet, C. M.: The Metal Chelate Compounds of Urine: Relationship to the Initiation and Growth of Renal Calculi, Am. J. Med. 19:87, 1955. Boyce, W. H.: Symposium on Etiology of Urolithiasis. Presented at annual meeting of the North Central Section, American Urological Association, Chicago, Oct. 1, 1955.

ADDITIONAL SOURCES

Vermeulen, C. W.; Grove, W. J.; Goetz, R.: Ragins, H. B., and Correll, N. O.: Experimental Urolithiasis: I. Evelopment of Calculi upon Foreign Bodies Surgically Introduced into Bladders of Rats, J. Urol. 64:541 and 549, 1950; 66:1 and 6, 1951; 68:790, 1952; 69:354, 1953; 72:93 and 99, 1954.

Andrews, J. C.; Yarbo, C. L.; Golby, R. L., and Sell, I. T.: Studies on the Mechanism of Formation of Renal Calculi, I. J. Urol. 73:930, 1955.

* * *

We must consider how very little history there is; I mean, real authentic history. That certain kings reigned, and certain battles were fought, we can depend upon as true; but all the colouring, all the philosophy of history, is conjecture.

—*Johnson*

Management of Post-Traumatic and Postoperative Spastic Paralysis

TEMPLE FAY, M.D., F.A.C.S., F.I.C.S.
PHILADELPHIA, PENNSYLVANIA

POSTOPERATIVE cerebral complications are not frequent in the individual experience of the general surgeon. Embolus, convulsive episodes, cerebral vascular accidents and angiographic and neurosurgical procedures all complicate recovery and contribute to the residual spastic paralysis that eventually requires long-term care and rehabilitation.

The problems presented by the post-traumatic types of spastic paralysis, however, are rapidly becoming an increasing responsibility of the general surgeon. During the past few years two serious changes have occurred in the otherwise routine planning of the majority of hospital chiefs of surgical services:

1. The automobile and the superhighway have transferred to the rural areas the majority of acute cerebral and spinal problems in the form of motor accidents, which fill the beds with transient patients beyond the hospitals' ability or capacity to care for them in addition to local demands.
2. The immediate care and convalescent period of the local rural and traveling public (old and young) is now in the hands of the general surgeon, who has not especially prepared himself for this particular neurologic-neurosurgical requirement.

The result of this almost three-to-one shift of acute cerebral and spinal trauma to the rural areas has brought forward the need of early and preventive treatment of handicapped persons who will eventually require treatment for residual paralysis, especially those lesions of the spastic brain and spinal cord which respond favorably to treatment. Obviously, the general surgeon must begin to familiarize himself with the fundamental requirements and the basic functions of the central nervous system.

It is no longer possible to ignore the rising mortality and morbidity figures and permit the patient's nervous system to take the blame. Lack of equipment, distance from specialized centers and lack of special neurologic training can no longer be relied upon to justify the end results, any more than lack of available oxygen for an emergency in anesthesia would be tolerated by the modern surgeon during a routine operative procedure.

The time has come for the modern surgeon to face realistically what William J. Mayo, in 1920, predicted would become a serious and growing obligation of those accepting the privileges and responsibilities of medical leadership. His emphasis was on the full duty of the surgeon, which begins with the diagnosis and proceeds to good operative technic, proper healing of the wound and necessary care. The sur-

---

Read at the Twentieth Annual Congress of the United States and Canadian Sections, International College of Surgeons, Philadelphia, Sept. 12-15, 1955.

Submitted for publication Oct. 10, 1955.

geon's responsibility is not fulfilled until the patient has been restored to his family, consideration having been given to his future social and economic activity as well as his health.

The term "rehabilitation" was not well known at the time Mayo pointed out that hospital confinement or surgical intervention is frequently a major disaster, requiring prolonged after-care, follow-up advice and consideration of the patient as a whole —his family, his job and his future. "Dr. Will" not only pointed the way to his staff and contemporaries toward technical advances in general surgery but, by establishing the "clinic" or group idea, as a means of obtaining accurate information and diagnosis, he showed clear appreciation of the dangers these two advances might foster in themselves, if not closely combined with the follow-up and postoperative check-up as to the extent to which the patient has been restored to his former status or helped to an improved one.

There has been an increasing trend in recent years to adopt the "group" or "clinic" idea and devote it to study of the immediate ailment, with an almost striking disregard for the patient as a whole. The busy surgeon, internist or specialist has left to others the parts of the patient that think, worry and "carry on" and the many personal influences that restore health and activity after the original symptoms have abated or after dressings and immediate supervision are no longer needed. The trend toward specialization created yet another specialty, more remote from the responsible surgeon and from initial hospital care. This is the growing field of physical medicine and rehabilitation.

It was never originally intended that the clinic, hospital unit or receiving ward, with its diagnosis-screening and operating facilities, should become separated from the patient, his community life and his ultimate welfare. The reasons for this are many and have been observable over the past thirty-five years, but the fact is that the profession faces three serious problems that have attended this "group" or "specialized" trend, along with its technical and scientific advances:

1. Division of responsibility for the ultimate end results, so that "what's everybody's business becomes nobody's business."

2. Division of the human personality and life purpose into disjointed segments, which leads to an unfortunate dichotomy of mental concept.

3. Surrender of the high place the doctor has held in the social and ethical activities of the community, with its priceless gifts of honor and respect. Once the trusted family or personal advisor, he is now an elusive genius in an atmosphere of technical and sterile instruments, surrounded by the latest products of biologic science.

These are features that now threaten to destroy some of medicine's greatest assets. The entire human being cannot be arbitrarily separated into convenient categories of treatment and responsibility. Some means must be found to bind together the separated parts of the patient's problem, as the surgeon binds the edges of his wounds.

During the past thirty years the average life expectancy of persons in the United States has been increased by almost twenty years, so that need for long-term care and for complete recovery and effectiveness takes on an importance almost equal to that of immediate care. Preventive medicine for many geriatric handicaps begins with its own surgical and medical follow-up, including an immediate program for early correction, rehabilitation and full assurance of recovery from the major episodes of early and middle life in an age of great tension.

The appalling number of annual accidental deaths on the highways (38,300) and in the industrial world, as well as in the home (total, 95,000), is familiar to all. Accidental injuries have advanced to third place among human afflictions, according to Strong,[2] as the cause of untimely death —in 25 per cent of cases, death due to motor vehicle accidents.

The decentralization of industry and the spread of motor traffic into rural and remote areas requires every surgeon and medical practitioner to be familiar not only with the neurologic diagnostic signs of injury to the brain and spinal cord but with the proper emergency neurosurgical measures to save the life of the seriously traumatized patient.

Whether surgically treated or not, in either urban or rural hospitals or clinics, those who survive frequently present various degrees of injury to the central nervous system involving long-term recovery problems; problems that require training and proper treatment of the extremities, which may have incurred some form of spastic paralysis.

It is not the purpose of this paper to discuss the many combinations of cerebral injury with post-traumatic or postoperative residual lesions or complications that may occur, but some must be mentioned—spastic hemiplegia of varying intensity, with or without the aphasia and intellectual deficiency that may arise; traumatic lesions of the spinal cord associated with spastic paraplegia (1 in 15 severe injuries); triplegia, or quadriplegia. Any of these may delay recovery and handicap the patient. It is obvious that the present hospital clinic is not equipped or staffed to offer continuous care from the acute stage of initial injury to the subsequent phase of rehabilitation.

When the normal community "case load" of strokes, tumors or inflammatory conditions leading to spastic paralysis is added to the war casualty and accident load, it becomes impossible for an active emergency staff, to say nothing of a routine surgical staff, to maintain effective contact with patients who are transient and therefore available only at the time of accident, or patients who become local or specialized "problems" outside the initial unit of treatment.

It is here that the patient suffers most, in his separation from the active life of care and healing in the hospital and his removal to the detached or home care environment during recovery or the period of treatment for chronic conditions and rehabilitation.

The solution of such an involved problem, even assuming it to be practical and possible, must start with recognition of the serious lack of continuity that has arisen in the overall care of these patients, who seek recovery and who deserve a chance of continued activity.

There must be greater effort on the part of surgeons to establish strong rehabilitation units available for prompt reconstructive training after the acute phase. These units should be closely affiliated with the hospital and the surgical outpatient clinic. If the surgeon, the internist or the specialist is "too busy" to advise or supervise the recovery period directly, he should share this responsibility with the physiatrist and the physical therapist. Better functional recovery can thus be offered the patient, and later, during convalescence, the social, economic and vocational advantages he needs can be obtained through occupational therapy[3] and speech correction,[4] as well as proper mental and intellectual evaluation when obvious cortical organic defects have resulted from the brain injury.[5]

Enlightened medical leadership can be obtained only when those concerned with the acute and immediate problem at hand are familiar with the supporting neurologic structures that must carry the increasing burden to its eventual solution. The profession must heed Dr. Mayo's warning that the whole patient is the sum total of all of his parts and that the problems of greatest concern are those related to his final recovery, whereas those of the hospital-clinic episode are but a disturbing interlude in a life experience.

Surgical recovery of the cerebrally or spinally injured patient without planned rehabilitation means a loss to the community similar to that involved in the ancient use of the sharp knife without sterilization. Such an unscientific neglect of surgical technic would be condemned at once today. The result, of course, might be infection of the wound, impairment of the end result or even death of the patient. From a social and economic standpoint, neglect of consideration for the higher intellectual centers during the early hours of care may prevent full recovery and lead to total dependence or isolation of the patient, so that, even if he does not die, he must endure a purposeless survival period of morbidity. Since patients so neglected gradually gravitate to the chronic wards or to institutions and convalescent homes for long-term care, the surgeon rarely sees the pitiful results of his initially heroic efforts. The adage "out of sight, out of mind" has come to replace the former comment "A surgeon usually buries his mistakes." It would appear that today he simply ignores them.

The primary purpose of this presentation is (1) to point out the general measures needed to combat or favorably alter the acute post-traumatic and postoperative complications of spastic paralysis, and (2) to outline the types of therapy that may have value during recovery and the subsequent management of chronic aspects of the problem.

Care and Treatment. — What recent measures are now available to the surgeon and the physiatrist for preventing, modifying or treating the spastic types of paralysis with success? In spite of the traditional and almost axiomatic opinion that little or nothing can be done for residual spastic paralysis, clinical and experimental evidence now indicates that a favorable change and a new potentiality for recovery is arising for patients with spastic paralysis, as formerly occurred with regard to lobar pneumonia, cardiac operations and chronic tuberculosis. The almost hopeless attitude of the teachers of fifty years ago has shifted to a cautious optimism. The static neurologic practice of yesterday is becoming a dynamic program of recovery in the hands of the modern surgical and medical clinician.

Since the medical and surgical care of the public is the profession's responsibility, doctors must be alert to meet this shift of burden and dislocation of the specialized training required. Organic neurology and neurophysiology are fast becoming major fields of modern medicine.

The medical schools are woefully lacking in teaching and in granting the necessary hours for training students in the care of acute and chronic lesions of the brain and spinal cord. Scattered through physiologic, neurologic and occasionally neurosurgical departments are the facts that have now become almost as important for all physicians as is ordinary obstetric knowledge.

Hospitals in urban centers usually rely on the accident teaching and training service to cover the important features of care of the central nervous system. Unfortunately, the night intern is left with vitally important measures to carry out. His experience and training are usually limited. Consequently, the patient with injuries to the brain is accepted as virtually hopeless. The surgical chief is not always available, and neurosurgeons are miles apart. The patient's survival is more often a matter of good luck than of good judgment.

The profession is therefore faced with an active and growing increase in accidents and at the same time with an understaffed, insufficiently trained medical-surgical group to meet the many and grave responsibilities connected with this problem.

Most of the younger men have been fortunate enough to obtain some specialized experience in this field during their wartime assignments. Few, however, have remained in the armed services or been attached to the veterans' hospitals long enough to follow the chronic course of the patient to its ultimate result—especially the patient with spastic hemiplegia or paraplegia. Some of the veterans' hospitals have not yet taken up neuromuscular therapy and the special reflex training and care of spastic patients. Many of those assigned to the treatment of chronic conditions have never been required to care for patients in the acute stages, and *vice versa.*

From start to finish, the planned program for the spastic patient is still disjointed and without logical continuity or definite objective. It requires serious appraisal and coordination by those responsible for its various phases.

Data on Accidents in 1953

Motor Vehicle, Nonfatal
- 1,350,000
  - 880,000 (driver)
- *Deaths*
  - 38,300 (28.1 per cent)
  - 33,100
  - 27,200 Rural (71 per cent)
  - 11,100 Urban

Total, All Causes, Nonfatal
- 9,600,000
- *Deaths*
  - 95,000 (0.99 per cent)

The death rate from motor vehicle accidents per 100,000 of population (adjusted) is 25.1 per cent, an increase of 50 per cent in forty years. The death rate from *all causes* per 100,000 of population (adjusted) is 58.4 per cent; the approximate percentage of all deaths due to motor vehicle accidents is 40. The death rate is 3 to 1 for night over day driving and is greater in rural than in urban areas. This means constant and alert emergency staff and hospital facilities, especially at night.

Estimated annual medical and hospital fees for all accidental injuries total $700,000,000. The total for motor vehicle accidents is $100,000,000.

Assuming that hospital units are medical, this means $3,500 (all accidents) per active doctor (200,000) in the United States, or $500 per medical representative for motor vehicle accidents alone. For *work injuries* (1953) the total is 2,000,000. Injuries to the back total about 250,000 per year. Only 1 to 2 per cent are fatal or involve permanent disability. Injuries to the head (excepting the eyes) total 120,000 per year.

In public *nontransport* accidental deaths (1953), farming ranks third among all industries, and for some reason the farmer is more often the victim of a fatal motor vehicle accident off the farm than is any other worker.

Of a total of 1,250,000 injuries, with 14,500 deaths (mortality per 100,000 farm residents, 63.9 per cent), approximately one-third (5,000) occurred in the home or on the farm, and two-thirds were due to motor vehicles or implements. Approximately half of the injuries were due to injuries not connected with motor vehicles.

This high rural farm accident figure, added to load of normal medical care per patient, indicates that the life of the country doctor today is not only varied but overburdened. The obvious limitations of care and early special treatment for injuries to the brain and spinal cord are largely responsible for the end results, in my opinion, with regard to both mortality and morbidity.

Without further statistical detail, the sampling already given should focus medical attention on the following facts: 1.

The need for specialized medical training and hospital care has shifted heavily from urban to rural areas. 2. The mortality rate of 28.1 per cent for motor vehicle accidents is higher than can be justified by the cause alone. Comparative figures of 11 to 18 per cent have been obtained in organized units under active neurosurgical directions (Mock).[6] 3. The survivors present problems of partial or permanent disability, approximately 22 per cent of which are neurologic. 4. Among the survivors of injuries to the head and back, types and degrees of *spastic paralysis* of the extremities and trunk become a major problem.

The number of such survivors (undetermined) is far greater than is generally realized, even in the face of such amazing figures. Residual types of spasticity range from a slight defect in function or a slight chronic deformity to severe "bedfast" states of cerebral hemiplegia and spinal diplegia.

In addition to this ever-growing accident list, there is an equally significant group of patients with various types of spastic paralysis due to spontaneous cerebral vascular accidents. With life expectancy rising from approximately 50 to approximately 68 during the past twenty years, these complicate the geriatric problem.

At first glance the "accident case," with the serious emergency features that confront the surgeon, appears far removed from the "stroke" or cerebral vascular accident that commands the attention of the internist. But from the standpoint of the end results in terms of *spastic forms of paralysis,* those dealing with rehabilitation must view the causes in terms of the degree of injury and the characteristic mechanisms of the pathologic picture. *Treatment* for *spastic* forms of paralysis is quite similar in the two groups.

This immediately evokes the question, from the general surgeon and the internist alike, "What can you do for patients that have spastic paralysis anyway?"

The past few years have changed the concept of treatment for this particular neurologic condition as much as the advent of antibiotics has altered surgical and medical management of the usual prewar postoperative complications.

In those patients with severely injured brains and spinal cords who survive, it is now possible to prevent or greatly modify the degree of spastic paralysis that arises; but the disabilities, handicaps and deformities that arise gradually after operation or accident are not always obvious to the busy surgeon or internist after the patient has been discharged from the hospital. If the paralysis is obvious, the condition is passed on to other professional workers, who must be mobilized outside the hospital.

Prevention of eventual spasticity begins when the unconscious patient, or the patient with characteristic early signs of cerebral or spinal paralysis, is admitted to the hospital. The routine prophylactic administration of antitoxin and antibiotics is based on the prompt and obvious consequences that may follow if it is omitted. Unfortunately, those in emergency attendance do not face, and are not usually required to face, the economic and deforming consequences of spastic paralysis. With such high mortality figures, it appears sufficient for the surgeon or the internist to save the patient's life. The ultimate problems, it is assumed, must be cared for later, as they arise.

Abundant evidence is now accumulating that if prompt measures are taken (within four to eight hours of admission) to protect important brain areas, the result will be lowered mortality rates, more rapid recovery, less disability and higher degrees of functional efficiency in patients with comparable lesions when the results have been evaluated on the basis of ten to twenty years.

These observations are based on two

separate series in my own clinical experience: (1) 1,032 cases of head injury reported in 1930, and (2) 1,000 additional cases reported in 1938. During the past twelve years, intensive studies of the benefits of rehabilitation (postoperative, posttraumatic and spontaneous) to spastic, hemiplegia and paraplegia patients have been made to determine what preventive therapy can be developed and what treatment appears best suited to both the acute and the chronic phases of this condition.

The following recommendations are presented from thirty-five years of direct observation, trial, error and organized therapy:

Factors in the Production of Spastic Paralysis. — Acute and chronic anoxia is more often the cause of severe loss of voluntary control and spastic paralysis due to head injuries than is direct brain injury *per se.* The chief problem concerns volume relation and pressure, since the skull, in relation to the brain, acts like a tight cast upon an extremity.

Lack of pulsation and proper capillary blood supply to the cortex add insult to injury. Widespread loss of surface brain tissue (softening) results rapidly if circulatory balance is not promptly restored. Those who survive the acute local edema present *cortical atrophy* later, since this is too snug a "cast" to wear two or three weeks. Obvious loss of tissue may result.

The same general rules of treatment apply to the acute postoperative and posttraumatic phases of brain injury as are applicable to injuries of other organs.

Basic Requirements for Treatment During the Acute Phase: 1. Ample space is necessary for the required circulation, plus the *hyperemia* expected for repair (adequate compression of the skull or sustained spinal ventricular drainage). 2. Proper drainage of excess tissue fluids, subarachnoid or subdural, and measures to combat cerebral edema (spinal drainage, hypertonic solutions given intravenously, purgation, sweating, dehydration, etc.) are required. 3. Adequate oxygen must be delivered to the lung bed with adequate circulatory efficiency to carry it to the cortical levels oxygen tent, body temperature control and even refrigeration (85 to 90 F.). To insure tissue oxygen availability, cardiovascular, blood pressure and respiratory adjustments at the most favorable levels should be maintained during the period of unconsciousness, aphasia and paralysis. 4. Favorable posture of the patient is important. The head should be elevated so that the mastoid is on a level with the anterior chest wall; this promotes favorable jugular drainage. The side posture should be taken at intervals, with the paralyzed extremities uppermost, the head in the midline, the chest and back supported with sandbags, and the hemiplegic hand behind the patient, palm up over the buttocks. The paralyzed leg should be flexed at the knee. 5. Proper control of fluid intake and food is mandatory. (The tendency is to overindulge the patient.) Fasting is usually beneficial. Fluid requirements can be regulated by vein or by proctolysis. Too much fluid favors increase in C. S. F. volume, cerebral edema and anoxia.

The acute phase of spinal spastic paralysis (usually paraplegia) requires: 1. Immediate release of local compression or full exploratory laminectomy to remove clot, decompress the canal and open the dura if the lesion is transverse or severe. 2. Full exploration if there is bloody spinal fluid. (This usually indicates direct trauma to the cord or root, which is an undesirable situation from the standpoint of late functional recovery. Local relief may favor functional return or partial recovery, which otherwise would be impossible.) 3. Control of infection at any point in the body. Even low grade cutaneous infection, infection of the upper part of the respiratory tract or infection of the bladder will delay and prevent recovery, assuming that recovery is possible. 4. Immediate suprapubic cystotomy for transverse myelitic types of paraplegia. This assures drainage of the bladder, offers less hazard from infection or catheter disturbances and in twenty-two years of my experience has proved superior to the more palliative measures. 5. Physical therapy, muscle massage, reflex therapy, passive exercises, hydrotherapy and care of the skin. These are early considerations. 6. Special aids for ambulation or arm training for later walking with crutches. This should begin as soon as the patient's condition permits.

Complete transverse lesions of the lower thoracic part of the cord without signs of beginning recovery for one to four years have occurred in my series. Constant and intense therapy and active care probably had much to do with the favorable results in these cases.

General Nature of Spastic Paralysis.—Spastic paralysis has certain well-recognized features that must be present in order that one may distinguish it from other types of motor dysfunction: 1. The increase of tone and muscle response known as the "stretch reflex." 2. Exaggeration of deep tendon reflexes. 3. Certain pathologic reflexes, such as Hoffmann's, Babinski's, ankle clonus, etc. 4. Partial or full loss of voluntary control of the part or parts involved. 5. Loss of skilled movements or specific intellectual faculties.

Prolonged spasticity and contraction of the muscles involved leads to *contracture* and deformity. Early treatment and preventive measures are required to prevent ultimate deformity.

Traumatic lesions of the brain or cord associated with paralysis usually undergo a preliminary stage of flaccid (hypotonic, arreflexic) muscle reaction. Spastic features appear later. Rechecks and frequent follow-up studies of the patient are required if either form is present. Prompt and proper physical therapy may be helpful.

The presence of weakness or paralysis (even though improving or apparently hopeless) requires careful assessment and analysis *before* the patient leaves the hospital or clinic, and copies of the data so obtained should be available to the unit or the individual doctors responsible for continuing treatment and observation.

Too frequently the patient is "lost" and is not seen again by the medical personnel familiar with the initial problem and the degree of impairment. Neither a correct history nor evidence of progress is available. Reevaluation of the situation is not always satisfactory to either the patient or the examiner. Valuable time and much recovery may be lost because of the "latent period" between discharge from one unit and admission to another.

Treatment of the Convalescent or Chronic Phase: Spastic paralysis differs from other forms of voluntary control in that it manifests the "stretch reflex." This means that the muscles, although paralyzed for voluntary effort, are responsive to local stretch influences and can be made to react reflexly by deep tendinous or superficial cutaneous stimulation. Tapping over certain tendons, e.g., for the patellar tendon knee-jerk reflex, as well as scratching the surface of designated cutaneous areas (Babinski sign) are common practices in neurologic examination.

By repeating the education of such a deep tendon reflex or by superficial stimulation of the skin repeated fifty to one hundred times, one causes the paralyzed part to react to each effort. It is thus spontaneously exercised and moves without voluntary control.

Spastic contracture thus may be prevented, and often the recovery of function finds the muscles and joints in usable condition. It is as easy as that! In the presence of spastic paralysis the reflexes are present for the seeking, and the patient has a "built-in" therapy unit available if he is only taught how to use it.

Repeated daily "reflex" exercise, combined with postural influences (Marie-Foix defense and pattern types), not only diminishes the spasticity of the paralyzed part but often leads to the "capturing" of certain reflexes by the remaining higher brain centers in which, even if the motor area of the cortex has been destroyed, walking and feeding movements may be reestablished in an otherwise apparently useless part.

Too frequently the spasticity is allowed to develop (with consequent deformity) to a point at which returning voluntary power is prevented from demonstrating its former ability to move the part. Both reflex activity and spasticity are spinal and medullary in origin, so that surviving patients with head injuries and residual paralysis have both of these factors available (increased tone and hyperactive reflex response). The *asset* lies in the increased reflex state of the muscles, the *liability* in the spastic tone.

Repeatedly exercising the muscles by using the reflex arcs and spinal cord combinations will reduce tone and prevent spasticity, in addition to maintaining joint function, favoring local circulation and preparing the paralyzed portions for return of function later if this is possible.

When should reflex therapy be started? Ten to fourteen days after the brain injury, or when signs of reflex activity or hypertonus appear. This means that a plan for therapy and an active program of treatment should be initiated before the patient leaves the hospital.

Since the burden of responsibility for the care of motor vehicle accidents has shifted from the urban to the rural areas, either properly trained physiatrists or physical therapists must be an available part of every hospital and rehabilitation team or mobile visiting units will be required. As a temporary measure, neurophysiatrists and therapists might be assigned by county medical societies to counsel and supervise rehabilitation in rural areas.

It is no longer possible to tolerate certain rural and urban mortality figures, some of which are 20 per cent above those for patients treated in highly specialized centers.

Spastic deformities and handicaps due to cerebral lesions or accidents, either traumatic or due to surgical intervention, are largely preventable and are now amenable to rehabilitation therapy if early and orderly measures are adopted and the patient is given proper routine care.

The increasing medical load of *cerebral spastic paralysis* arising from birth trauma and motor vehicle accidents require neurosurgical procedures. Postoperative complications and occasional meningeal infection, when added to the increased survival rate of the aged, in whom cerebral vascular accidents are common, require prompt evaluation and consideration with regard to (1) *prevention* when possible and (2) *prompt and proper therapy* when they occur.

The general surgeon, especially in rural areas, is fast becoming the determining factor in the end results.

Is the present accident mortality rate justified? Are the end results in those who survive acceptable because they are "the best that can be expected under the circumstances"? The answer to both of these questions, in my opinion, is emphatically *no!*

There is a growing tendency to consider the surgeon's responsibilities ended with his stitches and statistics. This means that the patient who survives severe accidental trauma today must find means of further recovery elsewhere than the hospital of initial care. The great difficulty is that those in charge of adjustment outside the hospital may or may not have access to the original records, and therefore find it difficult to plan or supervise postoperative care with success.

The general surgeon, even if he is to release responsibility and the overall obligation to the patient, must at least encourage properly trained colleagues in physical medicine or properly accredited physical therapists and vocational rehabilitationists to take over the remaining responsibilities and objectives.

The need to develop the three "R's"—Recovery, Reassurance and Rehabilitation—for injured patients is vital. This will require the same careful integration of the postoperative period as is customary in the initial treatment.

CONCLUSION

Preventive measures are possible when the brain as an organ is given the same decent surgical care that is accorded a leg or an arm surrounded by a tight cast. The same surgical principles apply to circulation in the skull cavity as in a plaster shell. The same space requirements are needed to permit free and adequate pulsation of tissue. When dural pulsation ("fluid cast") ceases around the brain, general signs and symptoms of disturbance of the central nervous system appear (headache, vomiting, hydrodynamic disturbances and abnormalities of pressure and volume operate relentlessly within the closed skull).

In order to favor adequate circulation with necessary *oxygen* (and the requirements of tissue for survival, function and repair), the *volume factor* (Monro-Kellis doctrine), as determined by the rigid skull, becomes the crux of the situation. Free pulsation of the brain can occur only if adjustable space is available for the to-and-fro movement of pulsation.

Increased intracranial pressure can arise only when there is some *solid resistance to the opposing volume* (circulatory blood, edema, cerebrospinal fluid, clot, cyst, etc.) reacting against it within a closed cavity.

It is obvious (even though impractical) that, if one should enlarge the container (remove the skull cap) and open the dura (wide decompression), the increased *pressure* would fall to an equilibrium with the other elements involved. *Pulsation* of the brain tissue and survival of uninvolved areas would then be possible despite the presence of expanding lesions such as contusion, hematoma and edema, just as it is possible elsewhere in the body when the surrounding tissues yield the required space.

If the cerebrospinal fluid volume were continually drained (as in the presence of cerebrospinal rhinorrhea, otorrhea or dural laceration), the space surrendered (120 cc., or 10 per cent) would permit edema of the brain tissue, with a chance for pulsating circulation to reach other tissues so that they might survive. Many severely injured patients survive when the fluid is thus removed. Few sequelae referable to the motor areas, where skills and expressive function reside and which are especially vulnerable to trauma and ischemia, will remain unless these areas are directly traumatized. The pyramidal cells of this area are exposed on the cortical surface. If they are lost, voluntary movement ceases and spastic paralysis follows.

In the last analysis, it is oxygen lack (anoxia) that causes the greatest early and permanent loss of brain function. The important cortical ganglion cells cannot survive four minutes (two hundred and forty seconds) of total anoxia. They die rapidly when chronic ischemia and hyperthermia (above 106 F.) is allowed to persist for hours or days. Administration of cooled oxygen in a proper tent or refrigeration of the patient to a rectal temperature of 90 F.[7] not only improves the availability of blood oxygen and combats hyperthermia but aids in the sedation of pain and restlessness.

The first surgical principle of wound healing is *an adequate blood supply.* This applies to the entire brain. The surgeon must furnish the entire brain with an adequate blood supply or suffer the consequences. If patients repeatedly lost hands or feet because of gangrene from too tight a bandage or cast, owing to oversight, neglect, ignorance or poor judgment, the surgeon or physician would soon be recognized as incompetent and deficient in common sense. If, however, the patient loses mental competence, the power of speech or the power of voluntary movement and becomes spastic for lack of blood supply to the surface of the brain, it is accepted as inevitable, on the basis of past experience. The question must be asked: Is the *"first surgical principle" of adequate circulation to the brain employed from the first hours of postoperative and post-traumatic care?*

If enlarging the cranial space available by decompression is not practical, continuous spinal drainage by means of a polyethylene catheter introduced through a No. 14 spinal needle will help to maintain the necessary volume of pulsating blood.

If fluids are required to combat shock and meet the general circulatory requirements of brain tissue they should be carefully measured, so that the brain will not become drowned and anoxic and thus be destroyed. Other methods of gaining space temporarily (the use of hypertonic solutions) may be followed by dehydration through restriction of fluids, with dietary control for patients with prolonged or chronic problems. These measures are valuable either with or without surgical decompression.

When physiologic procedures are adopted to protect the cortical areas the vital centers also benefit, and a decreased mortality rate follows. Thus, an alert surgeon who is not a slave to habit will apply the first surgical principle in measures to prevent residual spastic paralysis and atrophy of the brain. He will combat cerebral anoxia by all rational procedures and, at the same time, encourage early treatment and care of the patient in the days following the cerebral accident, whether traumatic or vascular.

True, in this atomic age a portion of the increase in the death rate may be due to the outright violence of the injury. The figures given apply to a survival period of one year. When one surveys the residual problems left for rehabilitation to combat, it appears true also that the rural and suburban areas, which must carry the bulk of this load, are not fully prepared to meet the role that has been forced upon them.

Additional equipment, further detailed study and improved staff teamwork are required to convert hospital units, which have become almost first-aid clearing stations in the rural areas, to a wider view of civilian care, both postoperative and post-traumatic. Planned therapy and orderly referral of afflicted patients to rehabilitation units have now become an immediate and important phase of surgical responsibility.

SUMMARY

The general surgeon in the suburban and rural areas has been forced to care for approximately 70 per cent of severe injuries and motor vehicle accidents. Of the 38,300 motor vehicle deaths in 1953, 27,300 occurred in rural areas and only 11,100 in the cities. The mortality rate, according to 1953 figures for both areas, is unjustifiably high (38,300 motor vehicle deaths out of 1,388,300 total injuries, or 2.7 per cent), compared with 95,000 deaths out of an overall accident injury total of 9,600,000, or 0.9 per cent. This indicates

the need for more specialized early care of the acute emergency and neurosurgical aspects of brain injuries, as well as more serious consideration of the extramural rehabilitation and subsequent patient treatment.

It is no longer possible to disregard the collateral medical requirements of treatment for spastic paralysis on the basis of nonsurgical classification or upon the past concept of paralysis as a hopeless complication.

The general surgeon must face the responsibility of tomorrow as regards the degree and severity of post-traumatic and postoperative spastic paralysis. It is no longer possible to hide behind the excuse that patients with injuries to the brain and spinal cord are doomed to die, or are to be considered "hopeless" or potential losses.

ZUSAMMENFASSUNG

Der Verfasser weist darauf hin, dass infolge des Anwachsens des Reisebetriebes und des Verkehrs in unserer Zeit das Problem posttraumatischer Hirnveränderungen, einschliesslich der spastsichen Lähmung, zu einem Gebiet des allgemeinen Chirurgen geworden sind, mit dem er sich notwendigerweise beschäftigen muss. Viele Automobilunfälle spielen sich auf dem Lande oder in ländlichen Gegenden ab, wo grosse chirurgische Kliniken nicht in der Nähe sind. Es werden Mittel und Wege erörtert, mit diesem Problem fertig zu werden, und es wird darauf hingewiesen, dass es angesichts der Tatsache, dass in den letzten drei Jahrzehnten sich die durchschnittliche Lebensdauer des Menschen um 20 Jahre verlängert hat, unerlässlich ist, praktische Methoden zu finden, Hirnverletzte so schnell wie möglich zu behandeln und wiederherzustellen.

RIASSUNTO

L'autore mette in risalto il fatto che in conseguenza del recente aumento dei viaggi e del traffico il problema dei traumi cerebrali e delle loro conseguenze, in particolare la paralisi spastica, è divenuto un campo di pertinenza del chirurgo generale. La grande maggioranza degli incidenti automobilistici avviene nelle zone rurali o semirurali, a distanza dai grandi centri chirurgici. Il problema della riabilitazione dei cranio-lesi deve essere affrontato senza alcun indugio.

RÉSUMÉ

L'auteur dit qu'à, cause de la fréquence récente des accidents de la route, le problème des conditions post-traumatiques, ainsi que celui de la paralysie spastique, est déjà devenu le devoir du chirurgien général.

Un grand nombre d'accidents de l'automobile ont lieu dans des régions rurales ou semirural loin des grand centres chirurgicaux.

L'auteur parle des divers moyens thérapeutiques et préventifs necessaires à sauvegarder ces victimes le plus tôt possible.

SUMÁRIO

O autor chama a atenção par o fato de que, devido ao aumento recente do trafego, o problema das afecções cerebrais postraumaticas, inclusive paralisia espastica, tem se tornado um campo necessario de estudo para o cirurgião geral. Um grande numero de acidentes de automoveis se dá em areas rurais ou semi-rurais, a uma certa distancia dos centors cirurgicos. São discutidos as maneiras e meios de tratamento, e é salientado que quase vinte anos de vida adicionados nas ultimas três décadas tornam imperativo que sejam verificados metodos sãos para o tratamento e reabilitação dos pacientes com lesão cerebral, o mais rapidamente possivel.

REFERENCES

1. National Safety Council, 1953.
2. Strong, G. F.: The Medical Profession and Traffic Accidents, J.A.M.A. 158: (July 11), 1955.

3. Fay, T.: Modern Horizons in the Field of Occupational Therapy, Proct. 1st Internat. Cong., World Federation of Occupational Therapists, Edinburgh, August 1954.

4. Fay, T.: Speech Analysis: A Cornerstone in the Rehabilitation of Language, Cerebral Palsy Rev., Jan.-Feb. 1953.

5. Fay, T., and Doll, E. A.: Organic Impairment Simulating Mental Deficiency, Am. J. Orthop.-Psychiat. 19: (Jan.) 1949.

6. Accident Facts. Washington, D. C.: National Safety Council, 1954.

7. Fay, T.: Observations of Generalized Refrigeration in Cases of Severe Cerebral Trauma. Baltimore: The Williams and Wilkins Company, 1945.

Conduct is the great profession. Behavior is the perpetual revealing of us. What a man does, tells us what he is.

—Huntington

The best part of beauty is that which no picture can express.

—Bacon

Dwell not too long upon sports; for as they refresh a man who is weary, so they weary a man that is refreshed.

—Fuller

He alone is an acute observer, who can observe minutely without being observed.

—Lavater

A prudent person profits from personal experience, a wise one from the experiences of others.

—Collins

Nothing is really work, unless you would rather be doing something else.

—Barrie

We are almost always wearied in the company of persons with whom we are not permitted to be weary.

—La Rochefoucauld

The last we discover in writing a book, is to know what to put at the beginning.

—Pascal

As it is the characteristics of great wits to say much in few words, so it is of small wits to talk much, and say nothing.

—La Rochefoucauld

Happiness is dependent of the taste, and not on things,—It is by having what we like that we are made happy, not by having what others think desirable.

—La Rochefoucauld

The hardest trial of the heart is, whether it can bear a rival's failure without triumph.

—Aikin

Many historians take pleasure in putting into the mouths of princes what they have neither said nor ought to have said.

—Voltaire

Current Fallacies of Statistical Records on the Radical Operation of Wertheim for Carcinoma of the Cervix

N. C. LOUROS, M.D., F.I.C.S. (Hon.)
ATHENS, GREECE
AND
LOUIS WOLFE, M.D.
NEW YORK CITY, NEW YORK

A REVIEW of the literature reveals that the extent of operations performed for carcinoma of the cervix varies, although each of the diverse procedures is referred to as a radical Wertheim operation. There is also disagreement in the observations and their interpretations, with important differences in record keeping, even when the records have been compiled from the same group or similar groups of cases.

Our purpose is to demonstrate the conflicting situation and to stress the main points of the classic radical Wertheim operation as performed by us.

First, it should be emphasized that the operation is a radical procedure, consisting not only of removal of the uterus, its appendages and all of the tumor, but of a large cuff of vagina as well, plus systematic excision of all the parametrial, paravaginal, paravesical and pararectal tissues, including the fat and areolar tissue covering the muscles and blood vessels, together with all the lymph nodes and lymphatics within these tissues.

It is perhaps not amiss to point out now that Wertheim laid stress on removal of the lymph nodes not only for its prognostic value, as some claim, but mainly for its therapeutic importance. Thus, excision of the nodes characterized the operation. Surgeons lose sight of this when they refer to any such radical procedure, with or without lymph node dissection, as the Wertheim operation.

Antoine, one of Wertheim's youngest pupils, recently outlined Wertheim's last technic, which fully describes excision of the nodes. One of us (N.C.L.) can confirm the description, having had the privilege of observing Wertheim operate on many occasions shortly before his demise.

If one peruses the literature with the foregoing facts in mind, the following facts are manifest:

1. The basic principles of the classic operation are not completely followed. Some surgeons consider the operation a slightly extended panhysterectomy, with

---

From the Department of Obstetrics and Gynecology, University of Athens, and the Alexandra State Maternity Hospital, Prof. N. C. Louros, Director.
Read at the Twentieth Annual Congress of the United States and Canadian Sections, International College of Surgeons, Philadelphia, Sept. 12-15, 1955.
Submitted for publication Dec. 7, 1955.

excision of the parametria. Others go further and include the removal of more or less of the fatty areolar tissue with the nodes existing therein. There are also differences in the extent of ablation of the pelvic blood supply. Classically the uterine artery is clamped and cut. Some, instead, clamp and cut the hypogastric vessels. In our opinion the last-mentioned practice interferes in a great measure with the proper blood supply to the remaining tissue in the pelvis, and this has obviously a significant bearing on the entire course of the disease and its statistical evaluation.

2. Selection of the types of cases is not uniform. By some surgeons, especially in Europe, only patients who are good risks, with the disease in Stage I or Stage II, are carefully selected for operation. Others attempt operation in every case, regardless of the extent of the disease or the robustness of the patient. Mixing of the stages lowers the long-term salvage rates, which cannot be considered in the same light as rates for carefully chosen groups.

3. Patients with carcinoma *in situ* are often included in evaluations of the so-called radical procedure. Such a course of action will "flatter" the figures. Although Stage O tumors are not histologically invasive cancer and do not require radical surgical or irradiation cancer therapy for their control, we are convinced that, at least in some instances, the welfare of the patient is best served by resort to the radical procedure. We have taken this attitude because it is often impossible to prove unequivocally that the tumor is actually a Stage O lesion, and, with modern supportive therapy available, we consider it possible to reduce the operative risk to a minimum.*

4. Little consideration is given to an extremely important observation — the presence of residual cancer tissue in the parametrium, observed at operation shortly after irradiation. In these circumstances the incidence of bilateral and distant invasion of the nodes increases and the prognosis becomes unfavorable. This sign, if evaluated, has significant bearing on the ultimate salvage rates.

5. There is no unanimity in the choice of age groups, and there is a lack of consideration of age and its ultimate bearing on the statistics. Normally the disease is virulent. It involves a shorter life expectancy for young patients than for older ones.

6. Most responses, varying with different ages, indicate that no biologic picture is constant; neither is the incidence of the tumors. Fortuitous biologically lethal lesions are totally unpredictable and will always exist. The differences they cause in the records are also unpredictable.

7. The stage of the disease is perhaps the most important factor in the ultimate outcome and in the evaluation of results. The most flagrant errors occur in the matter of clinical staging. Impressions of preoperative evidence of palpable disease and its extent beyond the cervix differ, and so will the eventual records. Although it seems, as we have said before, that there is no general agreement on the treatment of patients with disease in Stage O, preoperative impressions of the condition are significantly influenced by the presence of parametrial thickening caused by inflammatory disease (especially old tuberculosis and endometriosis), postoperative thickening, adhesions, edema following irradiation and late reactions thereto. The determination of recurrence is based on similar evidence, so that confusion easily results.

8. Invasion of the lymph nodes is directly related to the stage or extent of the disease as indicated by the League of Nations, being significantly greater in Stage

---

*An illustration of [illegible] aged 23 with a lesior [illegible] although one of us [illegible] tion, the patient, at [illegible] later, shows extensive metastases.

II than in Stage I. With tumors preoperatively considered in Stage I, the incidence of metastasis to the pelvic nodes is high, approaching 45 per cent for Stages I and II. With the extent of the disease often in doubt, preoperative clinical detection of nodal deposits is also difficult. Even at operation the assessment of node invasion by palpation is subject to a high percentage of error, and the data developed therefrom are unreliable. Postoperative staging, as suggested by Meigs and Brunschwig, is not yet the accepted or universal practice, but in our opinion it should be generally adopted, being essential to the keeping of accurate records.

9. Surgeons differ in their clinical acumen and operative skill. Surgical efforts will thus differ, and the results may be inadequate or incomplete operations. It is significant that the less thorough the primary operation the lower will be not only the immediate and postoperative mortality rates but the survival rates as well.

10. Technical difficulties due to factors independent of cancer (obesity, old inflammatory processes, etc.), which have sometimes to be faced, differ in patients at the same stage of the disease. Thus the difficulties encountered in a Stage I case may be comparable to those in a case of advanced disease. The difficulties that beset the surgeon are due to the same physical conditions that interfere with determination of the true stage. Such difficulties will result in an increased incidence of operative deaths and postoperative morbidity and mortality, as well as a decline in the long-term salvage rate.

11. Even the nationality of the patients and the national incidence are neglected factors. It is significant that in Italian women and Negresses the incidence seems unduly high, while in Jewish women the ratio is about 6:1.

12. No consideration is given to another important factor—the time when the first treatment is given. There is also no agreement as to the time that should be considered adequate for follow-up, so that Winter's five-year principle is not always followed. Nor is there any fixed principle as to the minimum number of cases that should constitute a group for clinical observation sufficient to justify the compilation of statistics.

13. Record-keeping, follow-up methods and death certifications are not uniform. The accepted practice of counting untraced patients, as well as those dead of intercurrent diseases, as having died of cancer does not make for accuracy.

14. There is no full agreement as to pathologic procedure. Pathologic criteria are not standardized. No attention is given to the histologic type of tumor present at the time the patient is "staged." All the soft tissues and nodes removed at operation may not always be completely sectioned and examined microscopically, and the examination of sections often taken at random, as well as chance biopsies, may fail to reveal cancer cells even if they are present. Even Papanicolaoau smears are sometimes difficult to evaluate. Kartu and Meigs have emphasized this difficulty, especially in the presence of Stage O tumors.

15. The selection of cases is also a source of misunderstanding. On the basis of a series of almost 500 Wertheim operations, we consider that, in general, only patients with Stage I or Stage II disease should be subjected to the radical operation, although patients with disease in these stages are occasionally accepted for operation, provided that none of the generally accepted contraindications exist. In the latter cases successful operation is made possible by modern surgical facilities and improved care. Any comparison of systems and opinions on the selection of cases and their recording, however, is definitely unreliable. On the other hand, the controversial subject of the treatment of carcinoma *in situ* is ever present and by no means settled. Te Linde, McKelvey

and others have made significant contributions to this subject. Although some advise conservative management of this lesion, it is our conclusion, as we have stated, that a radical approach is more often indicated.

A somewhat recent but important perplexing problem of carcinoma of the uterine corpus, with a high incidence of metastasis to the regional nodes, has appeared in the literature. In these reports the percentage of cases in which the nodes were involved is outstanding, approaching that associated with squamous cell carcinoma of the cervix. It appears to us, however, after going over the favorable past results of simple total hysterectomy and the recent reports indicating nodal involvement in as many as 30 per cent of cases, the authors of the latter reports are discussing, not cases of carcinoma involving the corpus only, but cases in which the disease has also involved the cervix. Their reports are not clear on this vital point.

In the past the five-year survival rate has been variously reported, ranging as high as 80 per cent for carcinoma of the uterine body. Considering the route of spread of cancer of this area, one can readily understand the consistently favorable results obtained by the comparatively conservative mode of treatment that omits excision of the nodes and soft tissues of the pelvis. But when one is faced with a high percentage of node invasion, as in the recent reports, one must assume that one is not dealing with orthodox cases but with cases in which the cervix also has been involved by the disease. Heymann has classified such cases into a separate group, designating the lesion as "carcinoma corpus et cervicis." The tumors then behave like squamous cell carcinoma of the cervix, and the route for metastasis is along the same lymphatics, leading to the obturator, the iliac and the hypogastric nodes and producing the high incidence of node invasion. If, in cases of carcinoma of the corpus, it were usual for the high nodes to be readily involved, the favorable outcomes following simple hysterectomy in the past would have been less numerous. In cases in which the disease has spread to the cervix, the radical Wertheim procedure should be done if the patient's condition permits, but, when the cervix is not involved, simple total hysterectomy has stood the test of time as the proper treatment, and in our opinion the patient should not be subjected unnecessarily to the risks of the radical procedure.

16. In considering irradiation for cancer of the cervix there are similar confusing and nullifying factors, as has been indicated. In addition, the following points should be emphasized:

a. Unless the patient is operated on, the stage of the disease is never known; that is, unless the nodes are removed and examined microscopically, the incidence of tumor cell invasion of the nodes will remain unknown.

b. Radiation therapists differ in their technics and in their therapeutic facilities.

c. Tumors differ in their sensitivity to irradiation. In any series, a fortuitous type of radiosensitive or radioresistant tumor may predominate. On the other hand, opinions on sensitivity also differ. In the older European conception adenocarcinoma is less radiosensitive than is squamous cell carcinoma, but this concept has been recently changed in America.

d. The biologic response of the host is totally unpredictable. Under irradiation that would be regarded as inadequate according to known standards, cancer may frequently disappear because of some chain of events started in the host by a reaction to irradiation that is antagonistic to the growth of the cancer cells beyond the field directly affected by irradiation. On the other hand, there are cancers that remain incurable regardless of the form of treatment employed.

e. No consideration is given to the immediate response of the tumor to irradiation as a prognostic indicator. This would permit prompt resort to operation if the response is unfavorable, thereby saving valuable time.

f. More difficulty arises when data are collected after operation and irradiation have been used in combination. They assume the objectionable reflections from both and are further confused by the lack in uniformity of the time allowed between irradiation and surgical intervention. Kelly and Burnham, as early as 1916, concluded that the earlier irradiation was used postoperatively, the better were the final results. On the contrary, Meigs has stated that postoperative irradiation may be harmful when the nodes are not involved. In the past we have irradiated every tumor postoperatively. Influenced by Meigs, we now irradiate only those with proved positive cancerous nodes.

The difficulty in comparing irradiation with surgical treatment and also the statistics evolved from the two forms of treatment is thus much greater than would at first seem to be the case. Although the two forms of therapy are seemingly comparable, it happens that the material subjected to operation is totally different from that subjected to irradiation. With the exception of cases in which the tumor is radioresistant, all growths except the advanced or the hopeless can be treated by irradiation, whereas surgeons are limited to cases in which the disease is recognized early and the prognosis is favorable.

And now a word on the operation itself, according to my technic, with which I have had the honor of performing it at different hospitals in the United States, especially Dr. Alexander Brunschwig's department at the Memorial Hospital in New York. It seems to us that the cardinal points in the radical Wertheim operation are as follows:

1. Pentothal-curare-oxygen anesthesia is employed. Since the patient is in the high Trendelenburg position, the operating surgeon stands to the patient's right, in order not to cover the operative field or to overshadow it with his right hand. We prefer right-angle stout retractors to the self-retaining type, because of the readiness with which the blades can be adjusted as needed for better local exposure. By traction exerted laterally on the stumps of the infundibulopelvic and round ligaments, grasped with Kocher clamps, and medially on the uterus, grasped with Museux clamps, a triangular space is created which is very important for maintaining the anatomic picture in the pelvis and thus facilitating identification of the ureter and subsequent excision of the soft tissues. By blunt dissection the folds of the broad ligament are widely opened, and the bladder, after wide dissection of the vesicouterine fold, is pushed anteriorly and completely mobilized from the cervix.

2. Detection of the ureter is greatly facilitated by use of a folded dry sponge on a sponge stick. Careful and considerate handling of the ureter and conservation of the superior vesical blood supply to the bladder and ureter are of great importance. The loose areolar tissue of the lateral surface of the posterior leaf of the broad ligament is pushed down with the sponge stick, and thus the ureter is easily detected. To minimize the development of ischemic necrosis and fistual formation, it must be kept in mind that the blood supply to the upper pelvic portion of the ureter does not always come from the hypogastric artery. The origins of the blood vessels to this part of the ureter vary. They may arise from the aorta (just above its bifurcation), from the common iliac artery or from the hypogastric arteries. They vary from 2 to 6 or 7 cm. in length; in width, from fine filamentous structures to vessels 2 or 3 mm. in diameter. All these vessels should be preserved. On the

other hand, the blood supply to the lower pelvic portion of the ureter comes from fine branches of the uterine, vesical and vaginal arteries. The vesical vessels supply also the top and sides of the bladder, while the vaginal vessels supply its base, trigone and neck.

Since in the course of operation the branches of the uterine and vaginal arteries are divided, it is important to preserve the blood supply from the superior vesical arteries. The embarrassment of ureteral and vesical fistula formation and functional disturbances of the bladder is thereby minimized. In 180 operations we encountered only 3 ureteral and 2 vesical fistulas, while the general incidence of such complications, according to the literature, is approximately 10 per cent.

3. The uterine vessels should be ligated quite close to their point of origin from the hypogastrics, and the uterine bundles, consisting of the vessels surrounding soft tissues and lymphatics, should be removed completely, as they frequently contain numerous tumor cells.

4. As radical an excision as possible of the fatty and areolar tissues and the lymph nodes of the pelvis is imperative. It is important to remove as many of the lymphatics and lymph nodes as one can, by systematic excision of the fat, areolar tissues and nodes overlying the psoas muscles, the external iliac and hypogastric vessels, the tissues in the obturator fossa and those in the pararectal, parametrial, paravaginal and paravesical spaces.

It is also important to note that only by means of Bumm's incision, i.e., incision of the parietal peritoneum between the stumps of the infundibulopelvic and round ligaments, can the external iliac glands be reached and removed. The Kocher clamp has proved excellent for pulling and gently tearing away these tissues. A minimum of bleeding accompanies this maneuver, owing to increased contraction and retraction of the capillaries. The excision is further facilitated by use of the finger, and especially by the aid of the folded sponge on a sponge stick, which is used to push and sweep the structural tissues.

5. A large wedge of broad ligament should be excised, with as much of the cardinal and uterosacral ligaments as is feasible. The broad, the cardinal and the uterosacral ligaments are rich in tumor-bearing lymphatics.

6. At least half of the vagina should be excised after wide mobilization well beyond any point of infiltration of the vaginal wall.

7. The vaginal cuff should be continuously sutured to the anterior and posterior parietal peritoneum and the vagina closed with interrupted sutures. A painful scar, often the site of recurrence, can be avoided if the cut edges of the vagina are not joined edge to edge but brought together on their flat surfaces and then peritonized. No drainage is necessary. The abdominal wall is closed in layers as usual. An indwelling catheter is placed in the bladder for about ten days. The blood lost in the operation is approximately 900 to 1,000 cc.

Our operative and postoperative death rate is 3 per cent. Our survival rate is 67 per cent and, if corrected after exclusion of the untraced 10 cases, 79 per cent. Of course, these figures and their various aspects are also subject to the criticism we have formulated, and thus, in our opinion, they can be mentioned only incidentally.

Considering the basis of the present system for gathering data and then compiling statistics, it is clear that the method is at fault and that the figures are not accurate. Our own figures are no exception. It is not entirely a question of enlisting the aid of a skilled statistician. It is rather the material, the observations and the interpretations that are not in accord. The upshot of the entire situation would seem to be that the possibility of gathering valid and useful figures has become extremely dubious, if not nonexistent. This makes it unfeasible to compare statistics from clinic to clinic with regard to the radical Wertheim procedure. The confusion, we fear and regret to say, is in all probability destined to continue.

Nevertheless, a challenge and a task await the profession. The system of recording cases and compiling statistics must be clarified and standardized. Perhaps an entirely new system is needed. There is an element of urgency about such an undertaking. Profound study, better coordination and closer correlation are essential to this task if surgeons are to have valid and useful records and statistics in the future—and if they are to avoid erroneous impressions, which otherwise are inevitable.

SUMMARY

The authors discuss in detail the various fallacies that exist in the statistical records on Wertheim's operation (or carcinoma of the cervix uteri) and its results. In the first place, they point out, many procedures differing widely from Wertheim's classic operation are still called by his name. These include a number of far less radical interventions. Other errors in the statistics, including those on age incidence, morbidity, mortality, complications and operative results, are due to wide variations in the diagnosis and "staging" of cervical lesions, in surgical approach and technic, in the extent to which the operation is actually radical, and in many other areas of appraisal. It is pointed out that the employment of skilled statisticians cannot alone solve the problem. Clarification and standardization of the material on which the statistics are based is the vital need. Profound study and improved coordination and correlation, say the authors, must be achieved if erroneous impressions and conclusions are to be eliminated.

RIASSUNTO

Gli autori discutono dettagliatamente i vari errori esistenti nei dati statistici a proposito dell'operazione di Wertheim (per il cancro della cervice uterina) e i suoi risultati. In primo piano essi sottolineano che molti procedimenti che largamente differiscono dalla operazione classica di Wertheim sono tuttora chiamati con questo nomeincluso un numero di interventi di gran lunga meno radicali. Altri errori statistici quali quelli riguardanti l'età della frequenza, la morbilità, le mortalità, le complicazioni e i risultati della operazione sono dovuti ad ampie variazioni nella diagnosi e nella classificazione dello stadio della lesione cervicale, nel procedimento chirurgico, nella estensione dell'asportazione e in molti altri campi di valutazione. Si sottolinea inoltre come l'impiego di abili statisti non possa da solo risolvere il problema. Il punto vitale è la chiarezza e la standardizzazione del materiale su cui si basano le statistiche. Gli autori dicono che per eliminare le impressioni e le conclusioni sbagliate occorrono studi più profondi e migliori coordinazioni e correlazioni.

ZUSAMMENFASSUNG

Die Verfasser erörtern im Einzelnen die verschiedenen Trugschlüsse, die sich in den Statistiken der Wertheimschen Operation (zur Behandlung des Kollumkarzinoms) und ihrer Erfolge auffinden lassen. Sie weisen darauf hin, dass zunächst einmal viele chirurgische Eingriffe, die von der klassischen Wertheimschen Operation erheblich abweichen, doch noch deren Namen tragen. Dazu gehört eine Reihe viel weniger radikaler Eingriffe. Weitere Irrtümer in den Statistiken einschliesslich solcher, die sich auf Alter, Häufigkeit, Morbidität, Sterblichkeit, Komplikationen und Operationserfolge erstrecken, beruhen auf grossen

Unterschiedlichkeiten in der Diagnostik und Einteilung in Stadien der Gebärmutterhalserkrankungen, im Zugangsweg und der Technik der Operation, im Umfang der wirklichen Radikalität des Eingriff und in der Einschätzung auf vielen anderen Gebieten. Es wird betont, dass sic dieses Problem nicht ausschliesslich durc Anstellung erfahrener Statistiker löse lässt. Was wirklich unerlässlich ist, is eine klare Standardisierung des Krankenmaterials, auf der solche Statistiken beruhen. Um irreführende Eindrücke un Schlussfolgerungen zu vermeiden, ist nac Ansicht der Verfasser vor allem ein gründliche Untersuchung des Material und eine verbesserte Einordnung und Korrelation notwendig.

SUMARIO

Os autores discutem detalhadamente o varios enganos que existem nos registro estatisticos sôbre operação de Wertheim para o carcinoma do colo uterino e seus resultados. Em primeiro lugar eles excluem muitos processos que diferindo grandemente da classica operação de Wertheim são ainda chamadas por seu nome. Estes incluem um número de outras intervenções menos radicais. Outros erros na estatística, incluindo aquele sôbre a idade, incidência, morbidade, mortalidade, complicações e resultados operatórios são

Use of the Extra-Long Trochanteric Plate for Severely Comminuted Fractures of the Upper Third of the Femoral Shaft and the Subtrochanteric Area

W. COMPERE BASOM, M.D., M.S. (Orth.), F.I.C.S., D.A.B.
EL PASO, TEXAS

THE management of extensively comminuted fractures of the femoral shaft in the upper third and subtrochanteric regions is extremely difficult at times. The use of skeletal traction has not been uniformly successful in our experience. Usually a long period of hospitalization is required, and the prolonged bed rest may be accompanied by such complications as pneumonia, renal stones and decubital ulcers. Among the complications, also, may be nonunion, which of course, will eventually necessitate surgical intervention. It is therefore of great importance to have adequate apparatus for internal fixation and the necessary instruments and personnel available, so that, if satisfactory reduction cannot be obtained, or if it appears that the patient will not tolerate bed rest well, operation can be carried out. It is possible, of course, to immobilize these fractures by means of various other types of apparatus; however, my associates and I have been very pleased with the extra-long trochanteric anchor plate fastened to the slightly modified Smith-Petersen nail. This nail can be

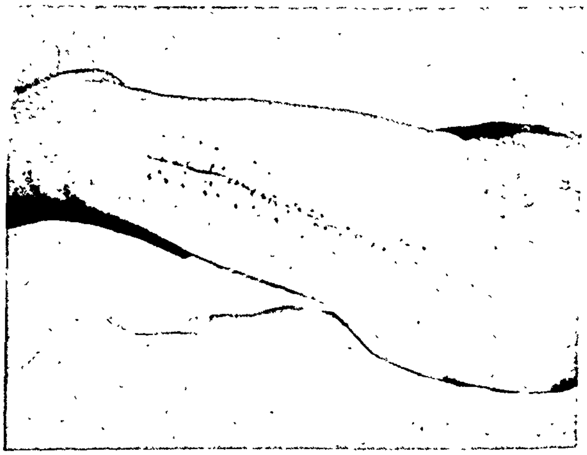


Fig. 1.—Skin incision after healing. The patient had a comminuted fracture of the upper third of the femoral shaft. A femoral nail was easily inserted into the central portion of the femoral neck, through the trochanter of the short upper fragment. An extra-long plate was applied to hold this in fixation. This patient has solid union and is getting along well at the time of writing. The skin incision begins just posterior or dorsally to the anterior superior iliac spine and extends posteriorly or dorsally and inferiorly or caudally to a sufficient length to expose the femoral shaft. In this illustration, as in those to follow, the patient's superior or cephalic direction is to the right. His inferior or caudal direction is to the left. In other words, he is lying on his back, his head to the reader's right and his knee is to the left. He is facing the top of the illustration.

Read at the Twentieth Annual Congress of the United States and Canadian Sections, International College of Surgeons, Philadelphia, Sept. 12-15, 1955.
Submitted for publication Dec. 20, 1955.

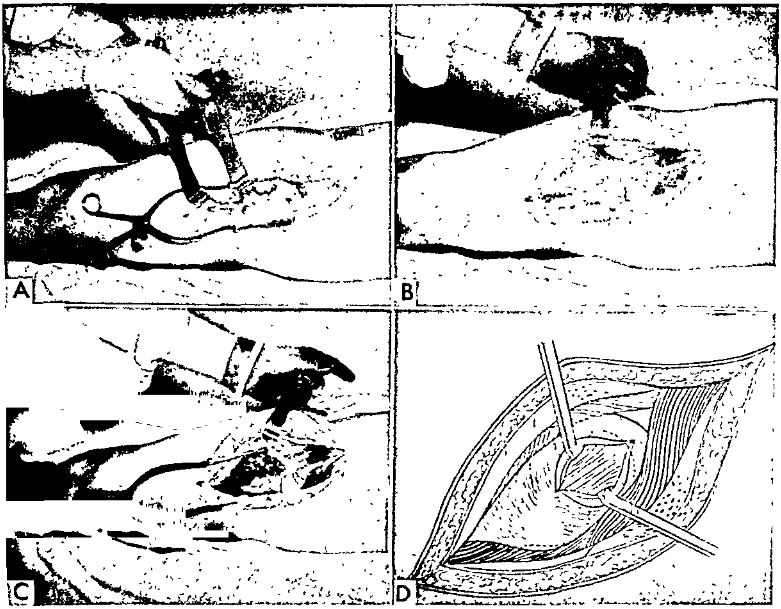


Fig. 2.—*A*, cadaver illustration of skin incision extended through subcutaneous tissue to deep fascia, with fascial incision started in inferior or caudal portion of wound. In an actual operative case the entire lower extremity is carefully prepared and draped so that it is freely movable, and the hip area likewise is draped so that it is completely exposed. Of course, the skin is carefully covered with towels once the incision has been made, and the leg is carefully wrapped in a sterile drape of the pillowcase type. Under the hip region there is a tunnel for roentgenographic film so that check-ups can be made if indicated; one merely flexes the hip to get the lateral view, taking both the anteroposterior and the lateral view of the femoral neck region with the roentgen tube placed in the overhead position. *B*, cadaver illustration showing complete division of deep fascia in line with skin incision. In the lower portion of the wound the vastus lateralis can be seen, and a section in the anteroposterior direction is seen through its origin for retraction of this muscle to expose the lateral femoral shaft and fracture site. In the superior or cephalic part of the wound is the vastus medialis. Just anteriorly or ventrally to this muscle is the tensor fasciae latae, with the retractor on its lower portion. There is a thin, translucent layer of soft tissue connecting this fascia to the trochanter. If this is divided, the fascia can be retracted anteriorly and the interval between the gluteus medius and the tensor fasciae latae muscle easily exposed. By going between these two muscles the femoral neck, covered by the capsule, can be easily exposed. A short incision can be made parallel to the long axis of the femoral neck. A narrow elevator can be placed on either side of the femoral neck to retract the capsule, just enough for a clear exposure of the femoral neck. In this manner a guide pin can be inserted down the central postion of the femoral neck into the head with ease, rapidity and accuracy. *C*, cadaver illustration revealing retraction of vastus lateralis by its section in anteroposterior direction through its point of origin and distal vertical section from posterior part of that area to expose fracture site. The skin, the deep fascia and the muscle incision can be carried distally to expose a sufficient area of the fracture for accurate reduction and plating. *D*, necessary exposure of femoral neck.

used separately, which creates quite an advantage with regard to the amount of apparatus necessary for the management of hip fractures.

The introduction of the three-flanged nail by Smith-Petersen, together with that of the trochanteric anchor plate devised by Lawson Thornton and modified by Overton, made possible the apparatus to be described here. Of course, many others have contributed to the technic; the types of fixation for the management of fractures in the hip area proposed by such contributors as Compere, Cleveland and his associates, Harmon, Anderson, Key, Conwell, Kleinberg, Speed, Moe, Stuck,

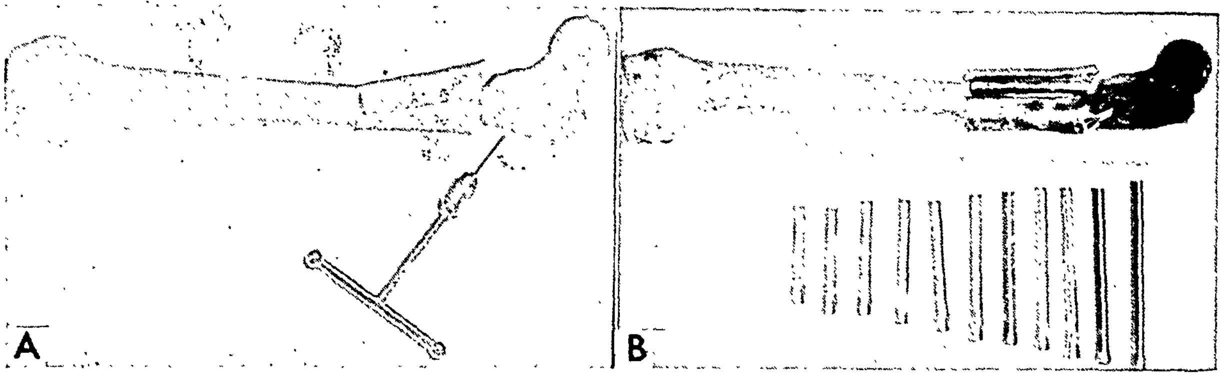


Fig. 3.—*A*, actual femoral bone with simulated fracture. The drill hole has been placed through the lateral cortex of the trochanteric region, and a guide pin has been inserted into the area of the femoral neck. The internal aspect of the neck can be palpated on all sides; then the guide pin can be inserted down the approximate central portion for placement of the nail. This can be varied, of course, according to the extent of the fractures and the trochanteric area involved. *B*, photograph illustrating selection of nail of proper length from Smith-Petersen nails available. Note the serrated head on a slightly slanting surface, which fits into the trochanteric plate.

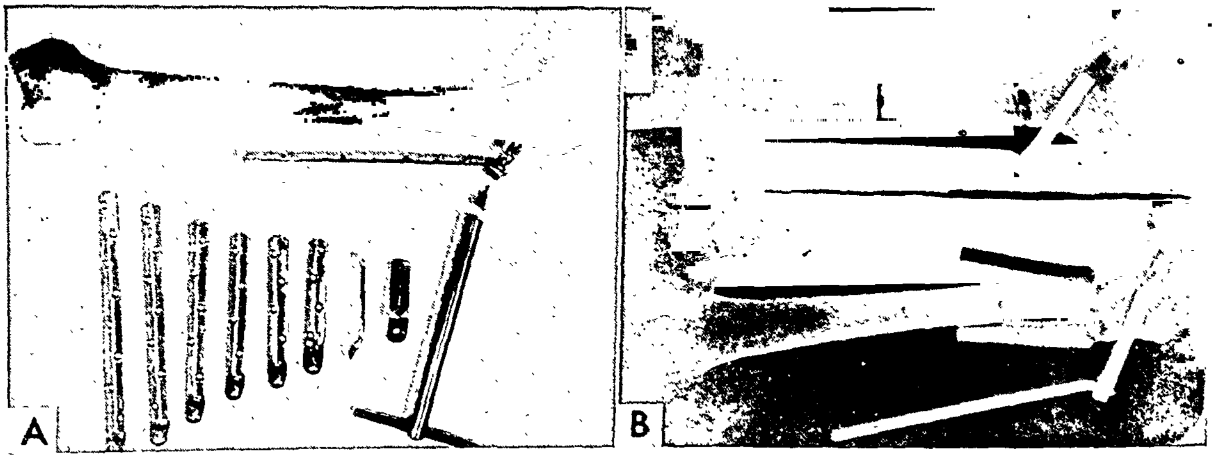


Fig. 4.—*A*, nail inserted approximately two-thirds of its length. A plate of the correct length is then selected and applied first. The fracture is reduced to the best extent possible by the assistant's traction on the leg and direct maneuvering of the fragments. If the hematoma and early organized blood clots are carefully curetted and removed from the fracture site, an accurate reduction can usually be obtained. All interposed soft tissue, of course, must be removed from the fracture. The various lengths of plates are illustrated. The shortest plate is shown facing the reader, so that the well in its head and the serrations on its wall can be seen. The second plate reveals the angle of the neck. The remaining plates are shown from the outer surface. In all probability it is best to order all of these stainless steel products, the plate, the nail and the bolt, and also the attaching bone screws from the same orthopaedic supply house, as all of these should be made out of the same metal. *B*, roentgenogram of the femoral bone illustrated. The fracture should be reduced as well as possible; the plate should then be carefully applied to the nail, and then the nail can be driven all the way in to the neck, allowing the plate to lie along side of the femur. This is easier to do than applying the nail and plate in one unit, then trying to reduce the fracture and finally trying to get the plate through the lower end of the wound. The lower end of the plate can easily be put into the wound, and pushed somewhat distally and then applied to the nail with a little retraction on the wound. The application of the plate to the nail should be done carefully, with careful fitting of the two together and tight bolting of the point of union before strain is applied to the plate.

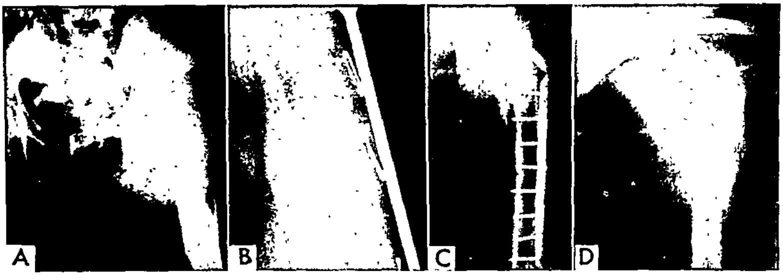


Fig. 5.—*A*, roentgenographic view of comminuted fracture of upper third of left femoral shaft. This femur is in skeletal traction, as are most of our injuries, since we prefer to treat our patients for shock and carefully evaluate their general condition prior to the use of open reduction if this is actually indicated. Despite strong traction, there was still a varus position in the relation of the neck to the shaft. Brand new drill points, definitely sharp, should be used on this type of fracture, as there are quite a few holes to drill and it is undesirable to leave a broken drill point in a bone, although at times it is unavoidable. The plate can be attached, at first, with about three screws and a bone clamp. Then the roentgenographi [illegible] alterations thereafter are not as time-consuming as if [illegible] ard bone, a drill with a diameter of 7/64 inch is best. [illegible] in diameter may add to the holding power of the bone screw and prevent the screw from pulling out. The screw should be placed well through the opposite cortex but need not extend too far into the soft tissue, although, if the surgeon is concerned about the possibility of the screws pulling out of soft bone, they can be extended beyond the opposite cortex. *B*, lateral roentgenogram of same patient, revealing separation and overriding of fragments. This fracture site did not produce the usual "clicking" sensation on palpation, and on open reduction actual muscle interposition was observed. C, anteroposterior roentgenogram revealing fracture reduced and solidly united six months after surgical intervention. This patient was walking, had no symptoms and was classified as having obtained an excellent result. *D*, anteroposterior roentgenogram of comminuted fracture of upper third of shaft of femur, with complete loss of apposition but excellent alignment.

Jewett, McLaughlin, Thompson, Blount, Austin-Moore, Neufeld, Haboush and others have contributed greatly to the development of proper apparatus. I have used the attachable trochanteric plate since 1938 and have encountered relatively few complications; the main one, which was due to the plate's coming loose from the nail, has been obviated by the proper fitting of properly altered apparatus. A Smith-Petersen nail has a serrated head. The cannula of the head is threaded for the driver; therefore, it will accommodate a bolt. The upper end of the plate has a well in it, with serrated edges on a slanting wall, which attaches to the nail with strong pressure. The serrations prevent rotation of the nail on the plate and thereby loosening of the bolt. None of the nail plates applied by myself has loosened. I placed such a nail plate in a parallel swivel bench vise and for months subjected it to daily stresses well beyond what would be brought to bear upon it within the fracture site. The nail plate attachment remained firmly in place and did not become loose. From an investigative standpoint, therefore, as well as on the basis of actual experience, the apparatus is well designed.

The various lengths of nails and plates can be selected in combination. The nail can be placed in almost any position in order to gain the firmest fixation in the proximal fragment; then the plate can be bent to accommodate the position of the nail and yet maintain anatomic alignment of the femoral neck to the shaft. The plate can be placed in a sterilizable vise during the operation and bent by blows with a hammer to confor [illegible] this [illegible]ition

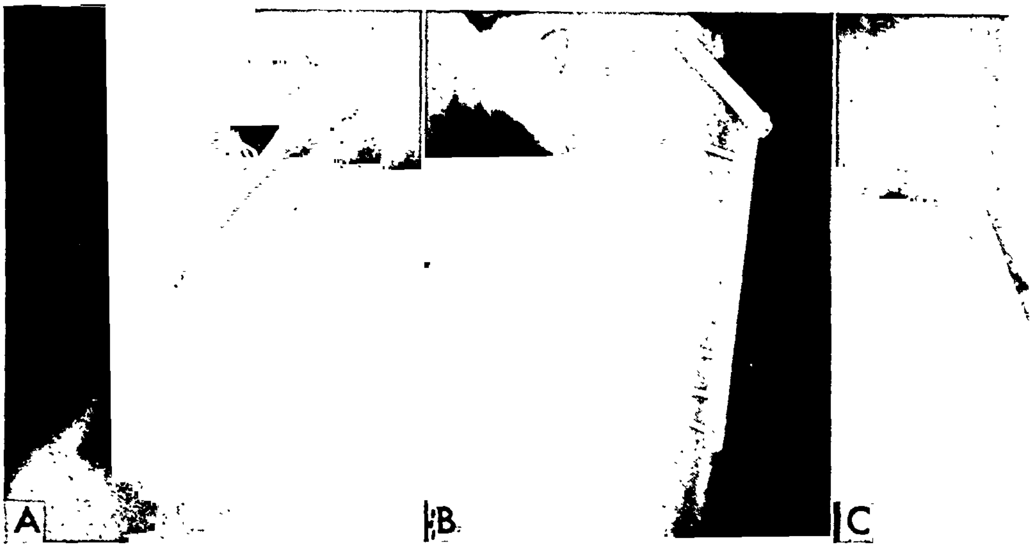


Fig. 6.—*A*, lateral roentgenogram of femur, revealing extensive comminution and displacement of fragments. *B*, anteroposterior roentgenogram of femoral fracture with nail plate fixation of reduction. This patient was very young. The femoral neck was rather solid, and it was necessary only to use a rather short nail. To provide firm fixation in an older patient, the Smith-Petersen nail should extend to the juncture of the head and neck at least. *C*, lateral roentgenogram in flexion, showing nail and plate in excellent position and fracture well reduced. This patient obtained an excellent result. He, like the one previously mentioned, was in the hospital for approximately four weeks and was able to walk after four months of crutches and partial weight bearing.

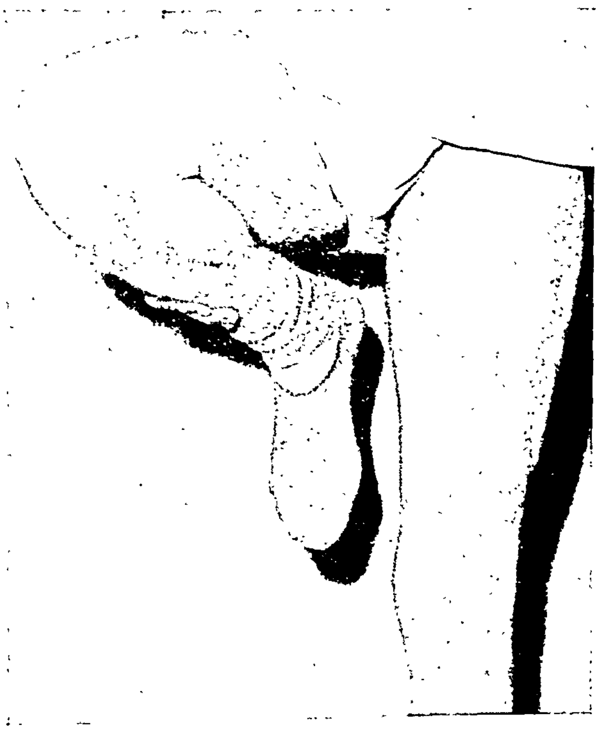


Fig. 7.—Patient standing. The skin incision is farther anterior than usual, because of contusion to posterolateral part of thigh. We try to avoid an area of soft tissue subjected to trauma even if it has recovered; such an area is likely to slough or become infected.

The plate can be fixed to the nail by a specially made dual screw arrangement; one screw is placed with threads in one direction, then an internal screw is applied with threads in the opposite direction for absolute fixation (Herz). The nail plate may create something of a bulge at its point of connection; however, this has not caused any important symptomatic complaint, and it presents a problem only when the patient is very thin. The nail is not likely to cut through the bone; it is not likely to drift, and in all my cases, including cases of intertrochanteric fracture, it has held its position well. Postoperatively, of course, the patient must be cooperative. There must be no weight bearing until union has occurred. Weight bearing prior to union, will probably result in breakage of the apparatus or its avulsion through the bone, and until more work has been done to prove that apparatus in this area will stand weight bearing I prefer to use the non-weight bearing program, which has given most fortunate results up to the time of writing.

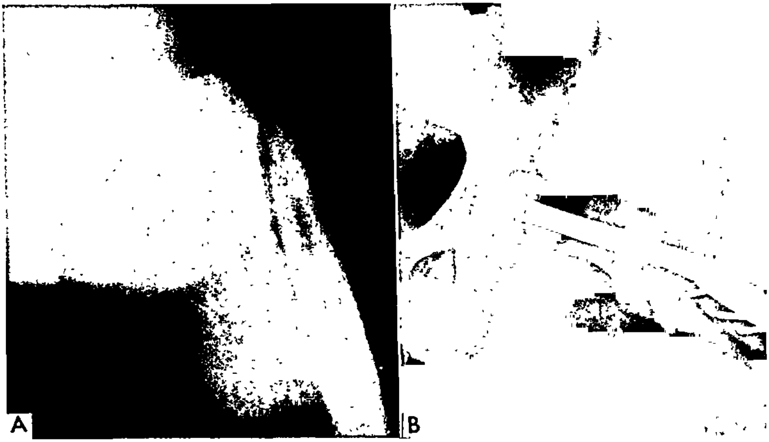


Fig. 8.—*A*, extremely comminuted fracture of upper third of left femur. *B*, lateral view in flexion after use of nail plate apparatus. (*Courtesy of Dr. Mario Palafox*).

The period of hospitalization is usually very short as compared to that made necessary by the traction method. The convalescent period, however, is a little longer than that of the average intertrochanteric fracture. The fracture requires a minimum of three months to unite firmly. In the small series I have reported, the fractures have united well in 10. In 2 additional cases it is too early for union to have occurred. There have been no complications, and the end results have been good.

It should be stressed that this is a formidable operative procedure. It should not be undertaken routinely. It should not be done unless all of the various steps that have been outlined are followed.

SUMMARY

The author reports that the extra-long trochanteric plate, attached to a Smith-Petersen nail, can be used successfully to provide internal fixation of extensively

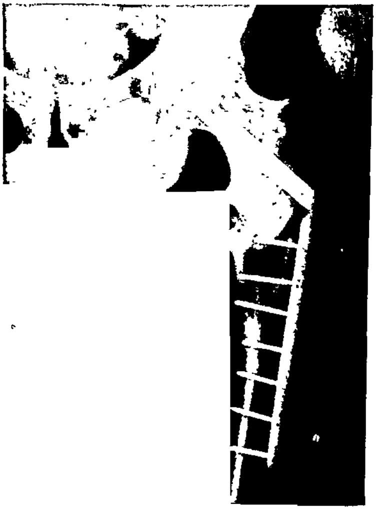


Fig. 9.—Anteroposterior film of fracture shown in Figure 8*A*, taken three months after reduction and fixation.

comminuted fractures of the upper third of the femoral shaft and the subtrochanteric region in patients for whom internal fixation is considered necessary. With the special technic required for application, the use of this plate has been successful. It is a formidable procedure and should not be undertaken unless all of the necessary steps, as outlined in this article, can be carefully followed. Other types of apparatus, of course, could probably be used to equal advantage, depending on the surgeon's familiarity with the various types.

ZUSAMMENFASSUNG

Der Verfasser berichtet, dass eine besonders lange Trochanterplatte, die an einem Smith-Petersen-Nagel befestigt wird, mit Erfolg zur inneren Fixierung erheblich zersplitterter Brüche des proximalen Drittels des Oberschenkelschaftes und der subtrochanterischen Gegend Verwendung finden kann, wo eine innere Fixierung für notwendig erachtet wird. Der Gebrauch der Platte hat sich bei Anwendung der besonderen Technik, die das Verfahren erfordert, bewährt. Die Behandlungsmethode ist kompliziert und sollte nur angewandt werden, wenn alle notwendigen Einzelheiten, die in der vorliegenden Arbeit beschrieben werden, sorgfältig ausgeführt werden können. Es gibt natürlich eine Reihe anderer Apparaturen, die sich in den Händen des Chirurgen, der mit ihrer Anwendung vertraut ist, wahrscheinlich als genau so nützlich erweisen.

RIASSUNTO

Gli autori fanno presente che si può usare con successo il trocantere nelle fissazioni interne di fratture comminote estese del terzo superiore del femore e della regione subtrocanterica in pazienti nei quali sia necessaria la fissazione interna. L'uso di questa tecnica è stato sod disfacente. Questo è un magnifico procedimento e non deve essere sottovalutato a meno che tutti i passi necessarii—che l'articolo sottolinea- non possano essere seguiti attentamente. Naturalmente e con ugual vantaggio si potrebbero usare certi tipi di apparecchi ma ciò dipende dalla familiarità del chirurgo con questi vari tipi.

SUMARIO

Refere o autor que a placa trocantérica extralonga, ligada ao prego de Smith-Petersen pode ser usada com sucesso para a fixação das grandes fraturas cominutivas do terço superior do colo do femur e da região subtrocanteriana.

Com a tecnica especial exigida para sua aplicação, o uso desta placa tem apresentado sucesso.

Representa grande progresso e oferece garantia se forem cuidadosamente seguidos todos os cuidados exigidos.

Naturalmente, outros tipos de aparelhos podem também ser usados com igual vantagem, dependendo da preferência do cirurgião.

RÉSUMÉ

L'auteur reporte qu'une plaque trochantérique d'une longueur extraordinaire, attachée au clou Smith-Petersen, peut bien servire à une fixation interne des fractures extensivement esquilleuses du tiers supérieur du corps du fémur et de la région soustrochantérique chez les malades qui ont besoin d'une fixation interne. Dans la technique spéciale, qui est nécessaire pour l'application, l'usage de cette plaque était suivi de succès. C'est une procédure formidable qu'on ne doit pas entreprendre sans que touts les détails, expliqués dans cet article, soient suivis péniblement. Naturellement d'autres sortes d'apparels pourraient offrir le même avantage, dependant de la familiarité du chirurgien avec les différents types.

BIBLIOGRAPHY

Anderson, R.; McKirtlin, W. B., and Burgess, E.: Intertrochanteric Fractures: Non-operative, Castless and Ambulatory Method of Treatment, J. Bone & Joint Surg. 25:153-168, 1943.

Anderson, R.: Journal of Bone and Joint Surgery 16:379-393 1934.

Bartels, R. N.: The Treatment of Intertrochanteric Fractures by Blade Plate Internal Fixation, Bull. Linn County M. S. 13:11, 1945.

Blount, W. P.: Blade Plate Internal Fixation for High Femoral Osteotomies, J. Bone & Joint Surg. 25:319, 1943.

Buckwalter, J. A.: The Immediate Treatment of Trochanteric Fractures, Am. Practitioner & Digestive Treatment 5:960-962, 1954.

Cleveland, M.; Bosworth, D. M., and Thompson, F. R.: Intertrochanteric Fractures of the Femur; Survey of Treatment in Traction and by Internal Fixation, J. Bone & Joint Surg. 29:1049-1057, 1947.

Compere, E. L.; Wallace, G., and Lee, J.: Materials for Internal Fixation of Intra-capsular Fracture of the Neck of the Femur, Arch. Surg. 44:327-338, 1942.

Cozen, L.; Brockway, A., and McMaster, P. E.: Operative Orthopaedic Clinic. Philadelphia: The J. B. Lippincott Company, 1955.

Evans, E., and Mervyn, W.: Trochanteric Fractures: A Review of 110 Cases Treated by Nail Plate Fixation, J. Bone & Joint Surg. 33-B:192, 1951.

Farill, J.: Neustra Conducta en las Fracturas Intracapsulares Del Cuello Del Femur, Gac. Med. de Mexico 73:85, 1943.

Haboush, E. J.: A Universal Nail: Instruments for the Treatment of Fractures of the Femur and Biomechanical Considerations, Bull. Hosp. for Joint Dis. 15:223-242, 1954.

Herz, J. R.; Breck, L. W., and Basom, W. C.: A Lock Screw for Attaching the Intertrochanteric Plate to the Smith-Petersen Nail, J. Bone & Joint Surg. 30-A:1008-1009, 1948.

Horowitz, T.: The Postero-Lateral Approach in the Surgical Management of Basilar Neck, Intertrochanteric and Sub-trochanteric Fractures of the Femur, Surg., Gynec. & Obst. 95:45-50, 1952.

Jewett, E. L.: One-Piece Anglenail for Trochanteric Fractures, J. Bone & Joint Surg. 23:803-810, 1941.

Key, J. A., and Conwell, H. E.: Fractures, Dislocations and Sprains. St. Louis: The C. V. Mosby Company, 1951.

Kleinberg, S.: Fractures of the Neck of the Femur: Surgical Technique for Reduction and Internal Splinting by Direct Visualization, New York State J. Med. 44:2460-2467, 1944.

Magnuson, P. B., and Stack, J. F.: Fractures. Philadelphia: The J. B. Lippincott Company, 1949.

McLaughlin, H. L., and Garcia, A.: An Adjustable Fixation Device for the Hip, Am. J. Surg. 89:867-871, 1955.

Moore, A. T.: Blade Plate Internal Fixation for Intertrochanteric Fractures, J. Bone & Joint Surg. 26:52, 1944.

Moore, M. Jr.: Treatment of Trochanteric Femoral Fractures with Special Reference to Complications, Am. J. Surg. 84:449-452, 1952.

Murray, R. C., and Freu, J. F. M.: Trochanteric Fractures of the Femur, J. Bone & Joint Surg. 31-B2:204, 1949.

Overton, L.: Cited by Stuck, W. G.: The Internal Fixation of Fractures. Springfield, Ill.: Charles C Thomas, Publisher, 1947.

Taylor, G. M.; Neufeld, A. J., and Jaryan, I.: Internal Fixation for Intertrochanteric Fractures, J. Bone & Joint Surg. 26:707, 1944.

Thornton, L., and Sandison, C.: The Treatment of Trochanteric Fractures of the Femur: Two New Methods, Piedmont Hosp. Bull. 10:21, 1937.

Smith-Petersen, M. N.; Cave, E. F., and Vangorder, G. W.: Intracapsular Fractures of the Neck of the Femur, Arch. Surg. 23:715-759, 1931.

Speed, J. S., and Smith, H.: Campbell's Operative Orthopaedics. St. Louis: The C. V. Mosby Company, 1949.

Venable, C. S., and Stuck, W. G.: The Internal Fixation of Fractures. Springfield, Ill.: Charles C Thomas, Publisher, 1947.

Watson-Jones, R.: Fractures and Joint Injuries. Baltimore: The Williams and Wilkins Company, 1955.

* * *

The weakest spot in every man is where he thinks himself to be the wisest.

—*Emmons*

Knowledge is to know both what one knows and what one does not know.

—*Confucius*

A good word is an easy obligation; but not to speak ill requires only our silence, which costs us nothing.

—*Tillotson*

Otolaryngologic Surgery

The Role of the Otolaryngologist in a Cleft Palate Care Program

EMANUEL M. SKOLNIK, M.D., F.A.C.S.*
AND
ELIO J. FORNATTO, M.D.**
CHICAGO, ILLINOIS

THE multiple physical factors that contribute to speech disorder in the patient with cleft palate must be altered by surgical or nonsurgical means so that the patient can assume his place in society with full responsibilities. This, of course, entails a carefully designed, integrated program of specialists striving toward a common goal — *effective care on a longitudinal basis to obtain superior functional results.*

The surgical treatment of cleft palate is a highly specialized branch of surgery of the head and neck. The otolaryngologist, in particular, is possessed of the proper grounding in the surgical anatomic and physiologic nature of the contiguous structures to render a most effective type of complete management. It is unfortunate, however, that in general the physician or surgeon frequently does not interest himself in the follow-up essential to the total care of the patient with congenital cleft palate and cleft lip. Since this type of operation is an elective procedure, there is time to evaluate the many aspects of the problem and eventually lead to a more functional definitive result for the patient.

The development of improved prostheses brings the otolaryngologist into contact with nonsurgical methods and provides a tool for a more thorough evaluation of the implications of medical and surgical management. Surgery in itself is not the answer. It is not enough just to "close a hole."[1] The split in the velum alters, physiologically, the muscles related to the eustachian tube, thus making the child vulnerable to frequent attacks of otitis media. Since the loss of hearing in a child with cleft palate has greater significance than in a normal child, it is imperative that patients thus affected receive continuous otologic surveillance. Deformities of the nose, external and internal, frequently create nasal obstruction, which must be corrected at the proper time. The tonsil and adenoid problem, so often the subject of controversy in the case of a normal child, deserves judicious evaluation when the child has a cleft, since the lymphatic structures are an integral component of the velopharyngeal mechanism for the development of normal speech.

The integration of essential specialties

---

*Assistant Professor of Otolaryngology, University of Illinois; Otolaryngologist to the Cleft Palate Center, Division of Services for Crippled Children of the University of Illinois.

**Assistant in Otolaryngology, University of Illinois, College of Medicine.

Read at the Nineteenth Annual Congress of the United States and Canadian Sections, International College of Surgeons, Chicago, Sept. 6-10, 1954.
Submitted for publication Sept. 23, 1955.

is necessary in order to achieve impressive clinical results.[2] The ear, nose and throat specialist must relate his services to those of the dentist, pediatrician, orthodontist, speech clinician and others in order to establish criteria for adequate care of the child or adult with the palatal deformity. The context of this coordinated therapeutic relation will be dealt with separately, in order that an overall perspective of the complex problems at hand may be obtained.

Eustachian Tube, Disease of the Middle Ear and Hearing Deficit.—Though knowledge of the physiologic character of the eustachian tube is only superficial, a close relation between palate and tubal activity during the process of phonation and deglutition has been clearly established. In the patient with cleft palate, owing to imbalance between the antagonistic paired symmetric levator and tensor palatini muscles, the ventilating function of the tube becomes altered. The effects of this muscular imbalance are further compounded by the abnormal movement of the tongue in the nasal cavity and the nasopharynx. Also, the eustachian tube in the patient with cleft palate is continuously irritated by food and secretions.

The existence of an altered ventilating action of the eustachian tube is demonstrated clinically by the great number of pathologic changes in the tympanic membranes of patients with cleft palates. In fact, such signs as retraction, marked thickening and opacity of the tympanic membrane are quite common. These signs are due to repeated infections of the middle ear or a disparity of pressure between the external and the middle ear. Difficulty in aeration of the middle ear in infancy, plus abnormal exposure of the orifice of the eustachian tube, tends to facilitate early insidious hearing loss without subjective symptoms.

Embryologic investigation shows a close relation between the palate, the eustachian tube and the middle ear. It is likely that the same factors that are responsible for approximation and union of the palatal plate will alter this relation. Therefore, the greater incidence of middle ear infections in patients with cleft palates must be stressed. The cause must be found in dysfunction of the eustachian tube and the frequency of middle ear disorders, as related to the embryologic factors and the size and type of the cleft. The hearing loss is characteristically conductive, with predominant loss in the low frequencies, and usually bilateral, with a similar pattern in the two ears.[4]

Closure of the cleft by operation or prosthesis, speech training and regular treatment of the ear, nose and throat are of the utmost importance for the preservation of normal hearing. Tonsils and adenoids in particular, when severely infected and causing persistent aural infection, must be removed, but with great discretion. The problem of auditory difficulty in relation to the condition of the cleft palate is of prime significance for the speech therapist. Eradication of the pathologic change in the middle ear may preclude the development of hearing loss, but frequently this can only be arrested.

The speech therapist, in treating children with cleft palates and hearing loss, is faced with a number of problems. It is necessary to know whether speech development and speech correction will be restricted in part by the hearing loss. It is also important, if the auditory deficit is progressing, to foresee any deterioration of speech acquisition. In this case the employment of therapeutic procedures, such as speech reading and hearing aids, may be considered.[5]

The otologist must maintain continuous vigilance over such children in order to control any disease process affecting the ears by removal of the causative factors and the foci of infection. Audiograms should be taken at frequent and regular intervals in order to follow the course of the disease and the effect on the ear.

In an analysis of several hundred patients with various types of palatal clefts, it has been observed that many factors are responsible for the large percentage of patients with hearing loss. The problem of hearing deficit is definitely related to such factors as the growth of the patient, the type and width of the palatal cleft, dysfunction of the eustachian tube, nasal deformity, lymphoid tissue in the nasopharynx, closure of the palate, prostheses, nutritional status and familial hearing ability.

The Nose.—Anatomic alterations of the nose may involve the external nose, particularly the columella and the lower alar cartilages, or the internal structures, especially the septum and turbinates.[6] Functional alterations of the nasal mucosa tend to predispose these children to infection of the respiratory tract, since the nose is constantly contaminated from the oral cavity.

It is the cleft of the lip that determines the external deformity of the nose. If the defect is incomplete and involves only the vermilion border, usually no deformity of the nose is visible. When a unilateral defect extends into the nose as a submucous cleft of the labial musculature that may be bridged only by mucous membrane, skin and some connective tissue, however, the homolateral lower alar cartilage is deformed. It appears displaced and flattened to a greater or lesser degree, according to the extent and width of the cleft. The distinction between a lateral and a medial crus in the flattened alar cartilage is often not clear. The tip of the nose usually is deviated toward the side which is not cleft.

If the cleft lip is bilateral, the deformity of the nose is ever more apparent and is dependent upon the forward displacement and size of the premaxilla covered by the median portion of the upper lip.[7] The columella is grossly underdeveloped or even absent, and the tip of the nose appears bifid and continuous with the soft tissue of the lip, the nasolabial angle being obliterated. The protruding premaxilla is attached to a stalklike vomer, and both alar cartilages are flattened in a downward direction.

When a complete cleft lip and palate is present the septum is usually severely distorted and the contour of the nose is affected, as are the normal respiratory and olfactory nasal functions. With unilateral complete cleft of the lip the septal border is projected diagonally toward the opposite side, while the quadrilateral cartilage and the perpendicular lamina are deflected toward the affected side, with resultant obstruction of both nasal cavities.

In cases of a complete unilateral cleft involving the lip, the alveolar ridge and the hard and soft palate, the septal deformity is often greatest. The septum is usually attached to the palatal process of the unaffected side, thus separating the nasal chamber from the oral cavity. The vomer is often seen in a diagonal plane toward the side not cleft and may assume a horizontal position in its inferior margin.

Complete bilateral clefts of the lip and palate present, on the contrary, a nasal septum generally in a midline position and firmly attached to the base of the skull, but unattached to either palatine process, supporting the premaxilla in front and assuming a stalklike appearance. Occasional asymmetries in the position of the septum, however, are encountered. In these cases the vomer is thick and rounded at its inferior border, while with the simple cleft palate, though it assumes an identical midline position, it appears thin and sharp. In the two types last mentioned, both nasal chambers are in direct communication with the oral cavity, and the turbinates appear particularly enlarged, owing to a boggy bluish mucosa.

The correction of these deformities involves several factors to be evaluated by the otolaryngologist: the age of the patient, the degree of deformity and the extent of functional impairment. It is known that surgical trauma to growing structures, particularly bone and cartilage, may impair further growth and cause permanent damage. On the other hand, impairment of nasal functions can endanger the patient's health. In every case a certain rationale must be followed. The first step is to repair the lip and restore the normal relations of the premaxilla to its neighbors. When there is severe functional nasal impairment due to a deviated septum the procedure of choice is to alleviate the obstruction, but not so as to involve the sacrifice of any of the growing cartilages.[8] Later, when full development has been reached, more thoroughgoing procedures that may require resection of bone and cartilages can be performed.

Close cooperation between the otolaryngologist, the pediatrician and the orthodontist is required. Certainly the role of the septum in the management and rehabilitation of children with cleft palates must not be overlooked, and the correction of its obstructing deformities must be coordinated with other forms of therapy.

Tonsils and Adenoids. — Immediately after closure of the cleft, and especially during the first five years of life, the child should be closely observed for local or systemic complications related to disorders of these pharyngeal lymphoid structures (Waldeyer's ring). Tonsillectomy and adenoidectomy for a child with a cleft, whether it has been surgically treated or not, poses an entirely different problem from that associated with a normal situation.[9] The decision to perform such an operation should impose a very careful analysis of the multiple-phase problem so frequently associated with the deformity. It is well known that removal of tonsils and adenoids from children with repaired cleft palates may alter or nullify the effect of the operation, or the prosthesis related to speech development.

In our experience, for a patient with a cleft palate in whom there may be congenital deficiencies of tissue and an impaired neuromuscular velopharyngeal mechanism, the adenoid is of the utmost importance in achieving adequate velopharyngeal closure for good speech; therefore, disorders of the adenoids, which may be a prominent etiologic factor in the hearing deficiency, should be treated by nonsurgical measures, such as control of infections of the upper part of the respiratory tract, an allergic regime, correction of constitutional deficiencies and the application of radium. If surgical intervention is imperative, however, their removal should be performed by an otolaryngologist fully experienced with the problems of cleft palate and possessing a thorough knowledge of the surgical anatomic nature of the contiguous structures.

After a routine tonsillectomy the tonsillar fossae appear heavily scarred; the anterior and posterior faucial pillars are often damaged and the speech severely altered. The importance of the palatopharyngeus and palatoglossus muscles, together with the pharyngeal constrictor complex of muscles, in speech and deglutition cannot be overstressed. To maintain these muscles in a state involving the least possible surgical trauma is extremely important in the proper speech development of the child with cleft palate.

Speech.—The otolaryngologist has much to offer the speech clinician in the rehabilitation of the patient with cleft palate. This evolves from his experience and knowledge of the basic anatomic physiologic and pathologic aspects of the head and neck and his intimate contact with them.

Though faulty habits of the jaw and tongue have been considered causes of the disarticulation,[10] hypernasality and nasal emission of either the surgically or the prosthetically restored anatomic defect, it is a generally accepted theory that the faulty velopharyngeal closure plays the greater role in speech disability.

The study of postoperative velopharyngeal movements has shown that the velum moves in a predominantly vertical direction and only slightly in a horizontal plane.[11] The extent of anterior movement of the posterior pharyngeal wall is generally normal. Whenever a closure of the nasal part occurs in a patient with cleft palate, it is a closure of the velum against adenoidal tissue.[12]

Radiologic studies reveal the relation of the adenoids to the typical speech defect of the child with a cleft.[13] It has been observed that the removal of these lymphoid structures can aggravate existing speech impairment, since the position of this tissue in the nasopharynx facilitates the action of the velopharyngeal mechanism. Its removal determines a greater distance to be covered by the soft palate (velum) in its posterior elevation. Lateral cephalometric films constitute objective documentary evidence of this phenomenon.

The significance of the adenoids cannot be overemphasized. This has been borne out on many occasions in the patient with a congenitally short palatal dimension and a deficient neuromuscular mechanism. Prior to adenoidectomy, speech is normal: postoperatively, the child presents the typical cleft palate type of speech. The velopharyngeal closure has been rendered inadequate.

Another fundamental factor in speech development and speech correction is the status of hearing. Since good hearing is essential to learning to speak, it is obvious that any hearing loss due to disease of the ear is an obstacle to the patient's acquisition of speech. Therefore, constant otologic vigilance must be maintained. The earlier the recognition, the better the chance of arresting the pathologic condition.

SUMMARY

As the cleft lip and palate are in the domain of otolaryngology and are closely related to the anatomic, physiologic and pathologic aspects of the ear, nose and throat, the role of the otolaryngologist in cases of cleft palate is of paramount importance. His activity begins before any surgical or prosthetic closure is performed and continues "longitudinally" afterward. He exerts active prophylaxis and treats, when necessary, middle ear diseases and subsequent hearing loss, as well as infections of the lymphoid structures and functional alterations of nasal mucosa. He evaluates and performs the reconstructive procedures indicated by the nasal deformities and respiratory impairment and collaborates with the speech therapist in determining the factors of speech impairment.

RÉSUMÉ

Lorsque le bec de lièvre et la fissure du palais sont dans la domaine otolaryngologique et—en ce qui concerne anatomie, physiologie et pathologie—qu'ils ont des rélations voisines a l'oreille, au nez et a la gorge, le rôle de l'otolaryngologue est énormement important dans les cas du palais fendu. Son activité commence avant qu'une fereture soit par opération soit par prothèse soit executée et continue tout le long après. Il prend soin prophylactique et il traite, si c'est necessaire, les maladies de l'oreille moyenne et la perte de l'ouie consécutive aussi bien que les infections de la muqueuse nasale. Il considère et exécute les procédures réconstructives qui

sont indiquées par des déformités nasales dérangements respiratoirs et il collabore avec le thérapiste en language en déterminant les raisons du dérangement de la voix.

ZUSAMMENFASSUNG

Hasenscharte und Wolfsrachen stehen in enger Beziehung zur Anatomie, Physiologie und Pathologie des Ohres, der Nase und des Halses und gehören daher in das Gebiet der Hals-Nasen-Ohrenheilkunde. Die Rolle, die der Otolaryngologe in Fällen von Wolfsrachen spielt, ist infolgedessen von überragender Wichtigkeit. Sie beginnt, bevor eine Schliessung des Defekts auf chirurgischem Wege oder mittels einer Prothese vorgenommen wird und setzt sich danach durch den ganzen weiteren Verlauf hindruch fort. Der Hals-Nasen-Ohrenarzt betreibt aktive Prophylaxe und behandelt nötigenfalls Mittelohrerkrankungen und darauf folgenden Gehörverlust ebenso wie Infektionen der Nasenschleimhaut. Die durch Nasendeformierung und durch Atembehinderung indizierten Wiederherstellungsmassnahmen werden von ihm beurteilt und ausgeführt, und er bestimmt in Gemeinschaft mit dem Sprachtherapeuten die an der Sprachbehinderung beteiligten Faktoren.

REFERENCES

1. Slaughter, W., and Pruzansky, S.: The Rationale for Velar Closure as a Primary Procedure in the Repair of Cleft Palate Defects, Plast. & Reconstruct. Surgery 13:341, 1954.
2. Cooper, H. K.: Integration of Services in Treatment of Cleft Lip and Cleft Palate, J.A.D.A. 47:27, 1953.
3. Stark, R. B.: The Pathogenesis of Harelip and Cleft Palate, Plast. & Reconstruct. Surgery 13:20, 1954.
4. Nassy, E. A.: Hearing Disturbances in Cleft Palate. Thesis, Amsterdam, 1952. Sataloff, J., and Frazer, M.: Hearing Loss in Children with Cleft Palate, Arch. Otolaryngol. 55:61, 1952.
5. Koepp Baker, H.: Disorders of Speech and Voice. In Lederer, F.: Diseases of Ear, Nose and Throat. Philadelphia: F. A. Davis Company, 6th ed., p. 1107, 1952.
6. Pruzansky, S.: Description, Classification and Analysis of Unoperated Clefts of the Lip and Palate, Am. J. Orthodont. 39:590, 1953.
7. Matthews, D. N.: The Premaxilla in Bilateral Cleft of Lip and Palate. Brit. J. Plast. Surgery 5:77, 1952-1953.
8. Salinger, S.: The Nasal Septum; Some Observations on Its Relationship to Palatal Deformities, Brit. J. Plast. Surgery 5:129, 1952-1953.
9. Beatty, H. G.: Relation Between Tonsil and Adenoid Operation and Cleft Palate, J.A.M.A. 145:379, 1951.
10. McDonald, E., and Koepp Baker, H.: Cleft Palate Speech: An Integration of Research and Clinical Observation, J. Speech & Heart Dis. 16:9, 1951.
11. Buck, M. K.: Postoperative Velopharyngeal Movements in Cleft Palate Cases, J. Speech & Heart Dis. 19:288, 1954.
12. Hagerty and Hoffmeister: Velopharyngeal Closure: An Index of Speech, Plast. & Reconstruct. Surgery 13:290, 1954.
13. Wilms, F. J.: Radioscopic Aspects of the Movements of the Soft Palate, Acta Otol. Belgica 7:294, 1953.

A cheerful, easy, open countenance will make fools think you a good-natured man, and make designing men think you an undesigning one.

—Chesterfield

You believe easily that which you hope for earnestly.

—Terence

Our deeds determine us as much as we determine our deeds.

—Eliot

Thinking well is wise, planning well is wiser; doing well wisest and best of all.

—Persian proverb

Allergic Sinusitis

LOUIS E. SILCOX, M.D., F.A.C.S., D.A.B.*

PHILADELPHIA, PENNSYLVANIA

SINUSITIS of allergic origin, although frequently not recognized, is the cause of the symptoms in over half of the patients who consult a rhinologist for nasal or sinus disease. It is usually associated with perennial allergic rhinitis, which is the most neglected of all respiratory allergies and by far the worst treated. The patient is usually given an antihistamine or a vasoconstrictor spray until complicating infection develops, or an obstructing polyp for which an operation is recommended without an adequate allergic study to determine the cause of the underlying pathologic condition. This common approach to such a fundamental problem is mentioned only to be condemned.

Allergic sinusitis is an inflammatory reaction of the sinal mucosa, yet is characterized by tissue edema with eosinophilic infiltration and a mucoid discharge from the glands and goblet cells of the mucous membranes. The edema usually disappears with removal of the allergen that causes the irritation, but if this cause is not removed the edema becomes more pronounced and polyp formation in the nose or sinuses is the end result. All degrees of mucosal thickening in the sinuses are encountered, from minimal reversible swelling to complete filling of the nose and sinuses with irreversible hyperplastic membranes and polyps. Symptoms produced by these changes vary; they include sneezing attacks, watery nasal and postnasal discharge, nasal obstruction and headache. The symptoms may be transitory or extremely persistent, depending upon the sensitizing agent, whether it is food, pollen, bacteria or an inhalant.

From the standpoint of allergy the first principle of treatment is that complete avoidance of offending allergens will result in complete relief of symptoms.

Allergic sinusitis has a quantitative basis — much allergen will cause severe symptoms and little allergen may cause few or no symptoms. When allergens are unavoidable, as is usually the case with house dust, or when partial avoidance alone fails to give relief, desensitization with an extract of the offending allergen becomes necessary. Results vary and are never as good as those of complete avoidance, because complete desensitization is never achieved.

The diagnosis of allergic sinusitis depends upon many factors, and the investigation should include a complete personal and family history, rhinologic and nasopharyngoscopic examinations, roentgen study of the sinuses, nasal smears for eosinophils and skin tests.

The fundamental fact to remember when one is treating allergic sinusitis is that the allergic patient is a special kind of person with an inborn defect. He has an unusual capacity for becoming sensitive to things in his environment; he is born that way, and he never loses his allergic potential until he dies.

Bacteria are involved more frequently in allergic conditions of the respiratory tract than in those of any other part of the body. Not only may these bacteria be the source of complicating infection in a case of allergic sinusitis; they may be the

---

*Professor of Otolaryngology, Graduate School of Medicine, University of Pennsylvania.

Read at the Twentieth Annual Congress of the United States and Canadian Sections, International College of Surgeons, Philadelphia, Sept. 6-10, 1955.

Submitted for publication Nov. 30, 1955.

focus of bacterial allergy, which is responsible for a major part of the hyperplastic change in the sinal mucosa. Bacterial sensitivities differ in that the patient becomes sensitive to certain strains of bacteria that he carries in his tissues, not to certain species of organisms. This explains the fact that autogenous vaccines are so valuable in the treatment of allergic sinusitis when there is a suspicion of bacterial hypersensitivity.

Antihistaminic drugs have come to play an important role in the symptomatic relief of allergic sinusitis. These were introduced because of the hypothesis that the allergic reaction in body tissue is due to local liberation of histamine, and these drugs were supposed to have a neutralizing or opposing action to histamine. They are of great help in reducing allergic swelling of the sinal mucosa and diminishing the excess secretion, but they should be used only for symptomatic relief, not as a substitute for definitive allergic therapy. The sedative properties of many of the antihistaminics must be emphasized when one prescribes them for daytime use if it is important for the patient to be fully awake and on the job.

Many clinical data have been presented recently on use of the adrenal cortical hormones in the treatment of nasal allergy and allergic sinusitis. In attempting to explain the mode of action of these steroids in allergic patients, Rawlins observed that edema which is the principal pathologic change associated with the allergic state, is located in the gel of connective tissue. The enzyme hyaluronidase liquefies the polysaccharide gel of the connective tissue and thus produces edema. In the presence of allergic inflammation this enzyme, which is present in connective tissue at all times, is liberated from damaged tissue in large amounts and is thus available for the production of allergic edema. The adrenocortical hormones, by neutralizing the enzyme hyaluronidase, restrict allergic edema.

Corticotropin (ACTH), the pituitary hormone, and cortisone, the adrenal cortical hormone, when given in the strengths required to effect beneficial results, not infrequently produces serious side effects and should be used only for patients who have failed to respond to more conservative therapy. It has been pointed out that cortisone, when administered over a period of time, may result in pituitary and adrenal cortical atrophy, and these tissues return to normal only slowly after administration of the drug is stopped.

Recent studies have shown that weak concentrations of hydrocortisone, when used locally as a nasal spray in allergic rhinitis and sinusitis, have produced beneficial effects. Allergic nasal symptoms have been relieved, and polyps have regressed remarkably in size. The amounts used are very small, and absorption is negligible. The effects of these steroids is entirely symptomatic, causing no change in the underlying allergic sensitivity.

When the pathologic condition is clinically and roentgenographically discovered to be irreversible, operation is indicated, but not until a thorough allergic regimen has been tried. Allergic swelling even of the chronic type will frequently respond to avoidance programs or injection therapy, but, if it does not so respond, radical surgical intervention is indicated for hyperplastic membranes, whether the changes are in the antra or in the ethmoid, frontal or sphenoid sinuses. Operation on the upper part of the respiratory tract during the pollen season is not advisable for allergic persons. In many instances hay fever and asthma have followed such procedures. If allergic sensitivities are not controlled prior to operation on the sinuses, then the new membrane that forms in the sinus will respond as the old one did, with mucosal thickenin a and polyps. This is one reason why surgical treatment of the sinuses has fallen into disrepute—failure to control the allergic reactions that cause the basic pathologic change.

CONCLUSIONS

1. Allergy is the pathologic basis of chronic rhinitis and sinusitis in most cases.
2. Adequate treatment includes avoidance of offending allergens as indicated by a complete allergic study and desensitization when necessary.
3. Symptomatic treatment with antihistaminics and adrenocortical steroids should not take the place of definitive treatment.
4. Bacterial hypersensitivity should be recognized and treated with autogenous vaccines.
5. Surgical intervention should be limited to patients with irreversible conditions who are on an allergic regimen. Operations on the upper portion of the respiratory tract should not be done on allergic patients during the pollen season.

ZUSAMMENFASSUNG

1. In den meisten Fällen von chronischer Rhinitis und Entzündungen der Nasennebenhöhlen ist eine Allergie die pathologische Grundlage der Erkrankung.
2. Zur wirksamen Behandlung der Erkrankung gehört das Fernhalten schädlicher Allergene, die durch eine vollständige Allergieuntersuchung nachgewiesen werden, und nötigenfalls die Desensitisierung.
3. Die symptomatische Behandlung mit antihistaminischen Mitteln und mit Nebennierenrindenhormonen sollte nicht an die Stelle der spezifischen Therapie gesetzt werden.
4. Überempfindlichkeit gegen Bakterien sollte erkannt und mit autogenen Vakzinen behandelt werden.
5. Chirurgische Eingriffe sollten auf Kranke beschränkt werden, die unter allergischem Regime stehen und unheilbare Krankheitszustände aufweisen. In der Saison der Pollenausstreuung sollten keine Operationen an den oberen Atemwegen ausgeführt werden.

SUMARIO

1. A alergia constitue a base patológica da rinite e sinusite crônica na maioria dos casos.
2. O tratamento adequado inclue evitarse de os alergenos nocivos como é indicado por um estudo alérgico completo e desensibilização quando necessário.
3. O tratamento sintomático com antihistaminicos e esteróides adrenocorticais não deve tirar o lugar do tratamento definitivo.
4. A hipersensibilidade bacteriana deve ser reconhecida e tratada por vacinas autogenas.
5. A intervenção cirúrgica deve ser limitada aos pacientes com condições irreversíveis que estão sob um regime alérgico. Operações da porção superior do tracto respiratório não devem ser realizadas em pacientes alérgicos durante a estação do polen.

RESUMEN

1. La alergia es la base patológica de la mayoría de los casos de rinitis y sinusitis crónicas.
2. El tratamiento adecuado incluye el eliminar los alergenos según lo indique el estudio alérgico completo, haciendo la desensibilización cuando sea necesario.
3. El tratamiento sintomático con antihistamínicos y esteroides suprarrenales no debe ocupar el lugar del tratamiento definitivo.
4. La hipersensibilidad bacteriana debe ser identificada y tratado por medio de vacunas autógenas.
5. La intervención quirúrgica debe limi-

tarse a los pacientes con estados irreversibles que se encuentran expuestos a los alergenos. Durante la temporada de los pólenes no se deben realizar operaciones de las vías respiratorias altas en los pacientes alérgicos.

RÉSUMÉ

1. Une allergie est la base pathologique dans la plupart des cas de rhinite et sinusite chronique.
2. Le traitement satisfaisant inclute l'évitement des allergènes qu'on a trauvé coupables par un étude allergénique complet et, si nécessaire, la désensitation.
3. Le traitement symptomatique par antihistaminiques et stéroides ne peut pas remplacer le traitement défini.
4. Une hypersensibilite bactérienne devait être reconnue et traitée par des vaccines autogènes.
5. L'intervention chirurgicale devait être réservée á des malades qui suivent un régime allergique et souffrent des conditions irréversibles. Des opérations aux voies respiratoires supérieures ne doivent pas être executées à des malades allergiques pendent la saison des pollens.

RIASSUNTO

1. L'allergia rappresenta la base patologica di molti casi di rinite e sinusite cronica.
2. La cura comprende l'eliminazione degli agenti irritanti, un completo studio allergico ed eventualmente la desensibilizzazione.
3. La cura sintomatica con antistaminici e steroidi conrticali non deve sostituire il trattamento causale.
4. Si deve riconoscere l'ipersensibilità battereica e trattarla con autovaccini.
5. L'intervento chirurgico deve essere riservato a quei casi che hanno lesioni irreversibili, però non si deve operare un paziente allergico durante la stagione dei pollini.

◆

> Change is everywhere, and change is desirable, for change is life. Only when we are dead do our osteoblasts and osteoclasts cease their tireless moulding and rebuilding, and our skeletons remain a changeless memory of the shell that once held our sorrows, hopes, and fears. It is good to live in a period of changes, to be concerned with the changes that are taking place in our art, to know that they are changes for the better, and to realize that among our fellow-countrymen and fellow-townsmen are names that will always be remembered as leaders of the advance.
>
> —*Ogilvie*

Plastic and Reconstructive Surgery

Treatment of Giant Hemangiomas

JOAO B. VIANNA, M.D.

RIO DE JANEIRO, BRAZIL

DEVELOPING from birth or soon afterward, hemangiomas usually keep on growing more or less slowly, sometimes attaining a huge size (Case 3, Fig. 3). Less frequently they regress (Case 1, Fig. 1).

As regression is not common, treatment should begin as soon as possible, before the tumor has expanded and made things more difficult.

Hemangiomas are usually treated by operation, radium, roentgen therapy or sclerosing agents, depending, of course, on the location and type of the tumor (cavernous, capillary, etc.) and the age of the patient.

Roentgen and radium therapy (to a certain extent) are dangerous when the lesion is located over bone growth centers, as it may be in children. Operation is usually performed on small limited lesions for which a simple excision will suffice. More extensive lesions require ligature of regional blood vessels or a wide and deforming excision that will need plastic repair.

Injection of sclerosing agents* is especially indicated for the cavernous type of hemangioma. The blood vessels are occluded either by thrombosis or by the strangulation caused by fibrosis. This is a simpler method of treatment and can usually be done in the office or the outpatient department.

For larger tumors this treatment requires a long time, and parents should be informed of this beforehand. Although it may be rather painful (according to the dose injected), procaine hydrochloride may be used to alleviate the pain.

At the beginning, injections should be limited to small doses (0.1 cc.), so as to determine the patient's sensitivity, and should not be repeated in less than four days.

Occasionally the sclerosing method and surgical intervention may be combined.

At the National Cancer Service in Rio de Janeiro I have treated a good many hemangiomas in both children and adults and have employed the two latter methods.

Radium and roentgen therapy have been used by the roentgen department but will not be described in this paper.

Of the hemangiomas treated, some were enormous. The cases in which they occurred will therefore be reported.

REPORT OF CASES

CASE 1.—A white Brazilian boy 2 months old was examined in my office on Aug. 3, 1945.

A *capillary hemangioma* involved the posterior outer and inner aspect of the left thigh and leg, the left gluteal region, and perineum and the scrotum (Fig. 1, *A* and *B*). It had a dark red rough surface and a great number of crevices that frequently bled and became infected.

I began the treatment by injecting 0.25 cc. of ethanolamine oleate (ethanolin) at the extreme distal border of the tumor.

Submitted for publication May 14, 1955.

From the Surgical Department of National Cancer Service, Rio de Janeiro, Brazil.

*Ethamolin: monolate.

Six injections were given at weekly intervals, and then treatment was discontinued because of intercurrent disease. The patient was seen one year afterward. The hemangioma had practically disappeared, and the skin in the area showed a pliable, thin scar surface (Fig. 1, *C* and *D*).

Cure was probably caused by thrombosis due to infection of the different crevices or initiated by the few sclerosing injections. It may also have been an instance of spontaneous regression.

CASE 2.—L. S. R. B., a white Brazilian 21 years old, was registered this service on Oct. 13, 1947. Since birth his tongue had been very large. Its size had continued to increase, so that after a few years he was not able to close his mouth completely. The lips and the anterior portion of the neck were also enlarged.

Nine years prior to this examination a course of radium therapy had been given to the tongue, with no improvement whatever.

Examination disclosed the huge tongue partially extruded between the lips and not allowing the mouth to close (Fig. 2, *A* and *B*). The lower lip, the lower half of each cheek and the suprahyoid and infrahyoid regions were also involved by the tumor. The tongue (Fig. 2, *C* and *D*) measured 10 by 8 by 5 cm. It was easily compressible. The same was true of the lower lip, the cheeks and the suprahyoid and infrahyoid regions. No abnormal pulse beats could be detected. The speech was difficult to understand, owing to the size of the tongue.

The lower dental arch was thinned out by the tumor (Fig. 2*E*). There was frank prognathism.

A diagnosis was made of diffuse cavernous hemangioma involving the tongue and lower lip, the cheeks and the anterior aspect of the neck. Treatment was initiated by injecting 1 cc. of ethanolin into the tongue every fifth day. After the third injection the patient did not return for over a year (Dec. 28, 1948). There was no modification of the hemangioma, but the lower lip showed an ulcer 2 cm. in diameter on its border (Fig. 2*F*). Biopsy disclosed "papilloma with malignant degeneration." This lesion was treated with radium needles.

On March 11, 1949, there was still an ulceration on the lower lip, due to radionecrosis. The lip was slightly smaller, but the tongue, cheeks and neck were the same size as before.

The external left carotid was then ligated below its superior thyroid branch. While the patient was being put on the operating table, with his neck extended, asphyxiation, due to compression from the hemangioma, was observed. The extended neck was released and the operation performed with the region under local anesthesia.

To reach the external carotid I was obliged to go through hemangiomatous tissue, which had to be pushed aside and which bled a great deal, making access to the vessel difficult. Just before the carotid was ligated the patient once more showed signs of asphyxiation. Cyclopropane plus oxygen by intubation was promptly given, and the operation was then finished.

Immediately after ligation of the external carotid the tongue underwent a slight regression in volume, although it was bleeding because of traumatism during intubation. With the patient still on the table an injection of 5 cc. of monolate was given in the left half of the tongue.

During the following seven days there was an intense reaction, and the tongue extruded greatly from the mouth.

In the outpatient department, four more injections of 1 cc. of monolate were made in the left half of the tongue at four-day intervals. On May 3 some regression of the tongue was noted, especially in the left half. The right external carotid was then ligated. Slight shrinkage of the tongue immediately took place.

Two days later 1.5 cc. of ethanolin was injected into the right half of the tongue and lower lip. After this, several courses of sclerosing injections were given at different intervals to the tongue, cheeks, lower lip and suprahyoid region. Appreciable regression of the hemangiomas of the lower lip had been obtained (Fig. 2*G*).

The injections were continued as before. On Nov. 4, 1951, immediately after a 2 cc. injection in the left cheek, severe pain developed and a well-delineated area of hyperemia was observed in the mucosa of the left cheek.

During the following days the local reaction continued, with local hemorrhages and fever. The patient entered the hospital again for treatment on December 12. That night, while lying in bed, he felt a sudden pain in the epigastrium, followed by anxiety and dyspnea, and died a few minutes afterward.

Autopsy was not permitted. A tentative diagnosis of pulmonary embolism was made.

CASE 3.—S. L. G., a Brazilian girl 2 months

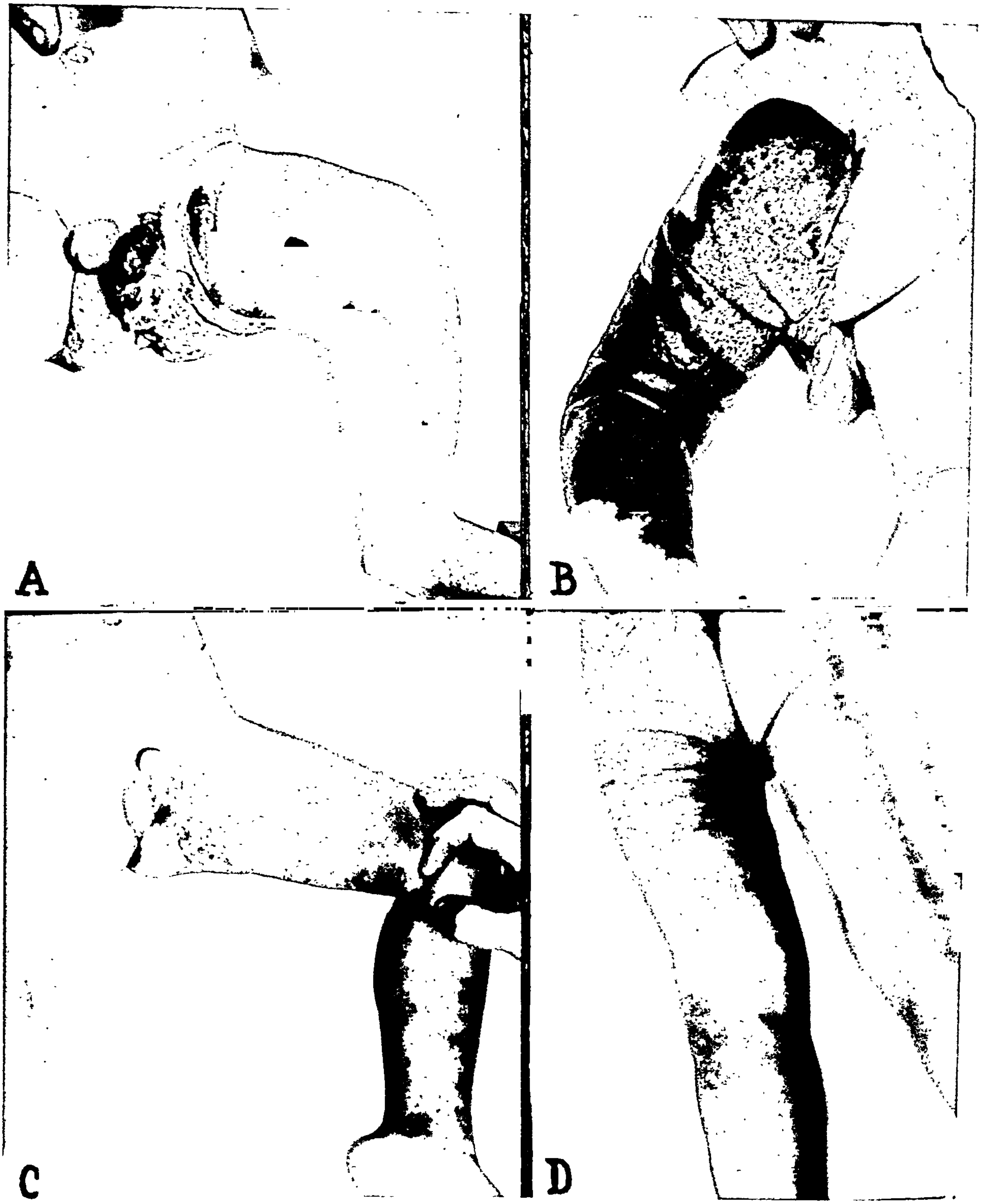


Fig. 1 *(Case 1)*.—*A* and *B*, hemangioma involving left thigh and leg, perineum and scrotum. *C* and *D*, patient one year later. Only a few sclerosing injections were given. The hemangioma has disappeared completely.

old was registered at this service on Aug. 3, 1950. Since birth she had had a dark red mark over the right parotid region and another over the lower lip. As the child grew older, the lesion involved the ear lobe also.

During examination a tumor was observed

in the right parotid region. A large, dark red mark with a rough surface covered the tumor and the right ear lobe (Fig. 3*A*). In the region of the lower lip and the suprahyoid region there were similar tumors and marks, but these were smaller (Fig. 3*B*). The tumors were compressible, but the marks on the skin showed no blanching on finger pressure.

A diagnosis was made of diffuse cavernous and capillary hemangioma involving the right parotid region, ear, suprahyoid region and lower lip.

Roentgen examination of the skull showed a shadow over the right parietal bone.

Sclerosing injections into the parotid tumor were begun on August 12 and continued at weekly intervals to September 9. In spite of treatment, the tumors continued to grow.

On November 24 I operated on the child. The right external carotid was ligated, and 4 cc. of ethanolamine oleate was injected into the parotid tumor. After the injection there was a severe local reaction, and dyspnea developed, compelling me to perform a tracheotomy on November 25.

A roentgenogram of the thorax disclosed a tumor in the mediastinum, which led me to the diagnosis of hypertrophy of the thymus. In spite of this the child's condition improved, and the injections were continued in the outpatient department.

Two months later there was still occasional dyspnea, and the tumor had not been much benefited by the treatment. A course of roentgen therapy was given over the mediastinum for possible hypertrophy of the thymus. Dyspnea gradually decreased, but there was no change in the mediastinal roentgen image. In May 1951 the tumor over the parotid region had increased greatly in size; the general condition of the patient was not good, and she continued to have dyspnea once in a while (Fig. 3*C*).

Palpation of the neck (Fig. 3*D*) showed that the hemangioma extended down to the infrahyoid region and possibly to the mediastinum, where I had previously received the impression of hypertrophy of the thymus. A more intensive sclerosing injection treatment was carried out at intervals of four days.

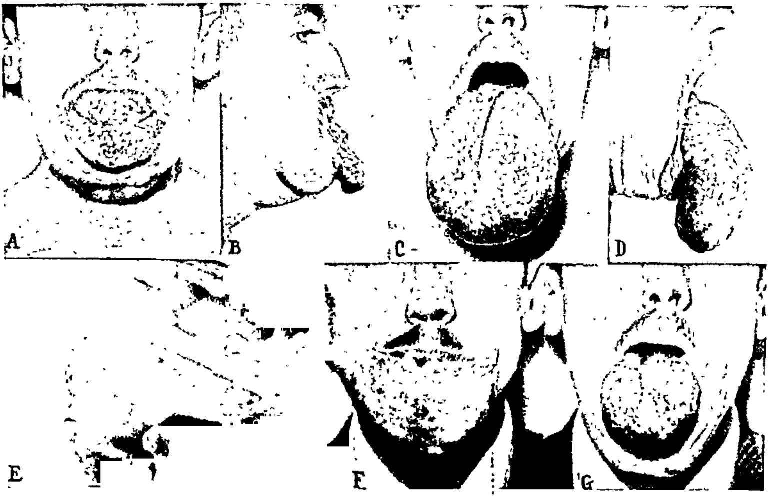


Fig. 2 *(Case 2)*.—*A* and *B*, condition of tongue before treatment. *C* and *D*, enormous enlargement of tongue. *E*, roentgenogram of jaw, showing deformities caused by hemangioma. *F* and *G*, patient during treatment. Some regression in size of lips and tongue is already noticeable.

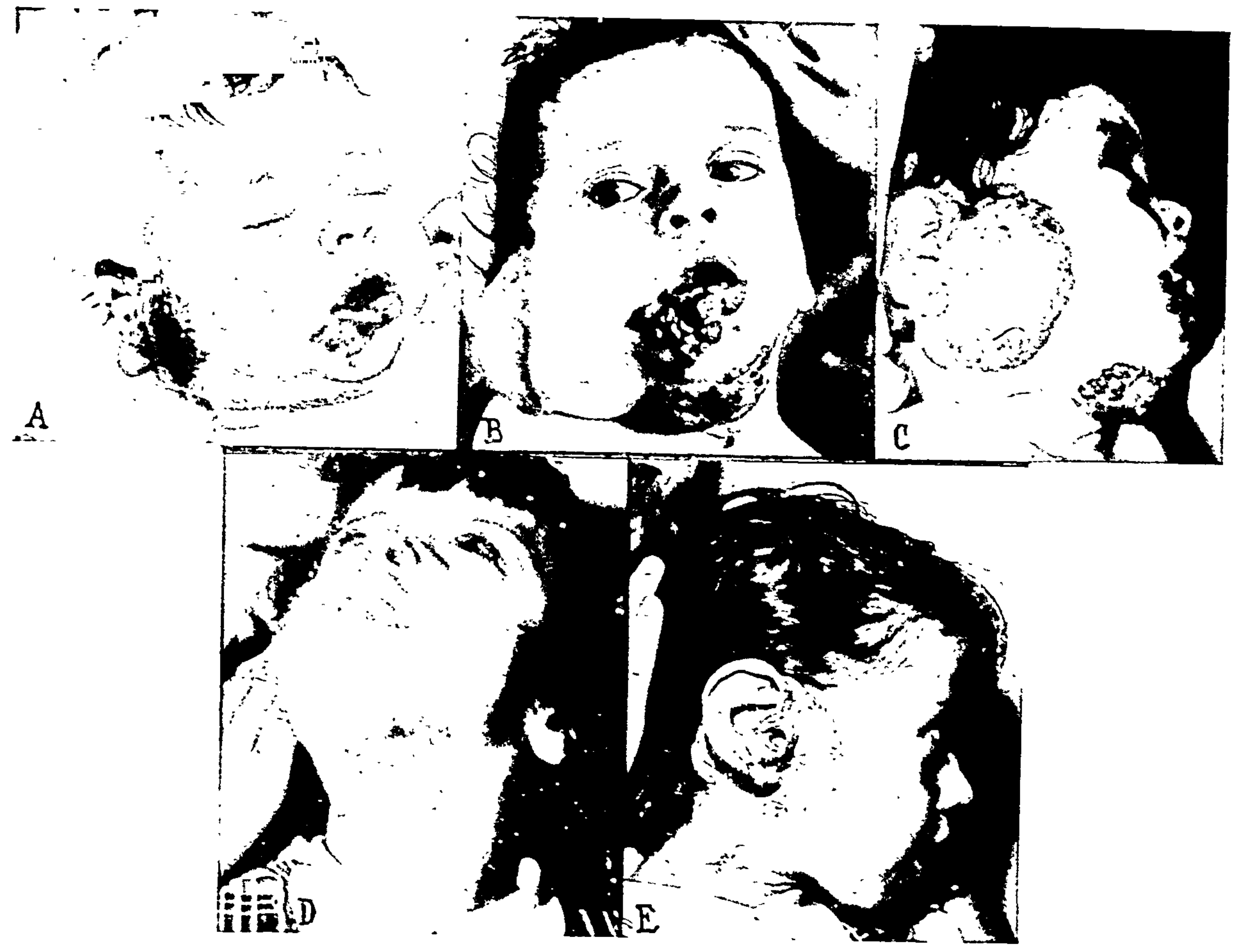


Fig. 3 *(Case 3)*.—*A*, patient before treatment. *B* and *C*, patient during treatment and after ligation of right external carotid. Despite treatment, the hemangioma continued to grow rapidly. *D* and *E*, patient after last treatment. Tumor has practically disappeared, and pliable scar tissue has taken place of red marks formerly present.

On Jan. 21, 1952, the whole tumor had hardened completely. By May 5 it had shrunk to less than half its previous volume.

From this time on dyspnea ceased, and from January 1952 to the time of writing the injections have been given irregularly at greater intervals.

Fig. 3*E* shows the great regression of the hemangioma.

CASE 4.—N. A. S., a white Brazilian woman 40 years old, came to this service on Oct. 12, 1950. She stated that she was born with a red mark on her face (she did not remember where). It gradually grew larger and larger, developing into a red tumor that extended over the face, scalp, neck and left ear.

Examination showed the huge red tumor mass extending over all these areas and part of the anterior aspect of the thoracic wall (Fig. 4, *A*, *B* and *C*). The right eye was covered by the tumor, the upper eyelid being only partly involved. A small part of the nose and part of the left side of the forehead were also uninvolved.

The tumor was dark red and had folds resembling the convolutions of the brain. Its consistency varied from hard to elastic except at the lower lip, where it was frankly compressible (cavernous).

When the patient opened her mouth the lower lip would hang down, owing to its size and weight (Fig. 4*A*). The inner surface of the left cheek and the left side of the tongue were involved (cavernous). The left ear was practically twice the normal size. The part of the hemangioma involving the neck and the anterior aspect of the thoracic wall was smoother and not so tumorous as the rest. Owing to the extent of the lesion, I decided to begin treatment by operation. On Novem-

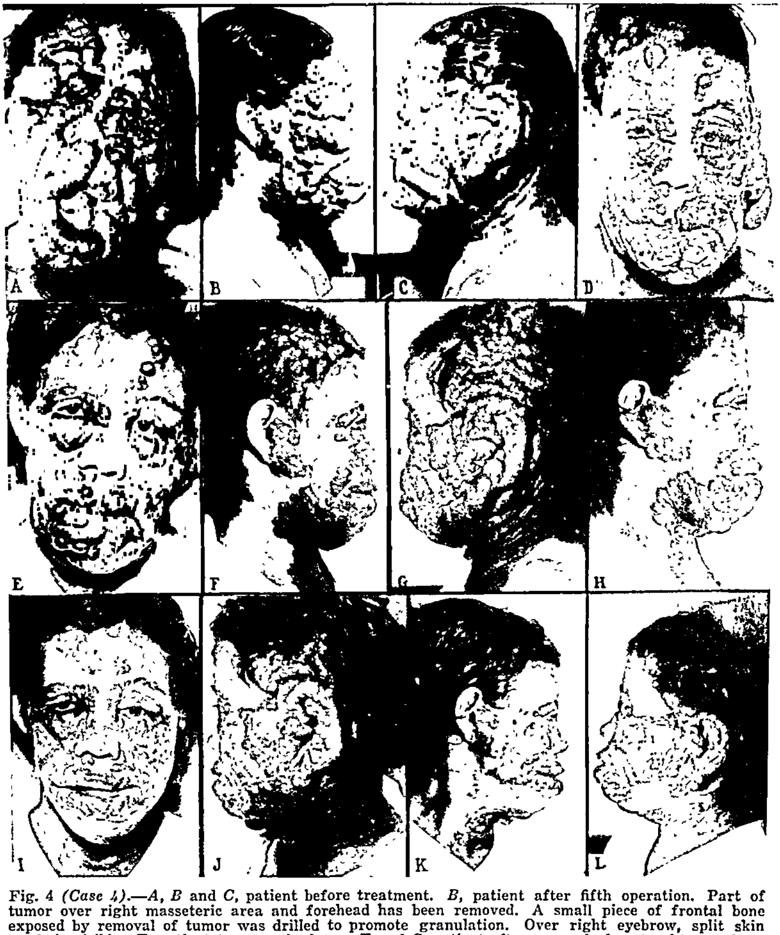


Fig. 4 *(Case 4).*—*A*, *B* and *C*, patient before treatment. *B*, patient after fifth operation. Part of tumor over right masseteric area and forehead has been removed. A small piece of frontal bone exposed by removal of tumor was drilled to promote granulation. Over right eyebrow, split skin graft is visible. *E*, patient two months later. *F* and *G*, patient after removal of parts of tumor from subhyoid and infrahyoid areas, lower lip, left half of upper lip, and left cheek. *H* and *I*, part of face treated by grafting and left ear removed by excision. *J*, *K* and *L*, patient after sixteenth operation, greatly improved.

ber 6, part of the tumor over half of the forehead was removed with the electric knife. As bleeding was not so profuse as had been expected, excision was continued without the electric knife. Hemostasis was obtained by compression and Oxycel gauze.

At the same operation two elliptic pieces of the tumor were remove om right of the face. Hemostasis was obtained by electric coagulation and suture of the wounds with No. 1 silk.

Eight days later two more pieces of the tumor were removed, one from the right half of the upper lip and the other from the right half of the suprahyoid region. Both wounds were sutured with No. 1 silk.

On November 21 the third operation was performed. Two pieces of the tumor were removed from the left half of the face and sutured as before. The full thickness of the middle third of the lower lip was also removed by a V incision; the coronary vessels were ligated, and the lip was sutured from the inside and from the outside in the usual way.

With removal of these different portions of the tumor and the formation of scar tissue, a certain shrinkage of the hemangioma began to take place. Part of the wound over the left side of the forehead and the right superciliary region was covered with a split skin graft removed from the right thigh with the dermatome (December 12). A small piece of the frontal bone, exposed by the first operation, was drilled so as to promote granulation from the diploë.

During a fifth operation on December 11, a large piece of the tumor over the right masseteric region was removed down to the fascial plane. Hemostasis was obtained by electrocoagulation, and the wound was left open to granulate. Figure 4*D*, taken on December 18, shows the patient at this stage of the treatment. The raw surface over the right masseteric region can be seen, as well as the split graft over the right half of the forehead and the area where the bone was drilled.

On December 19 the raw surfaces over the right masseteric region and the left side of the face (including the temporal region) were grafted.

Fig. 4*E* (Feb. 14, 1951) shows the patient two months later.

On February 17 parts of the tumor over the suprahyoid and infrahyoid regions were removed and the wound sutured with silk.

On March 27 a part of the tumor over the left half of the upper lip and left cheek, as well as a part over the lower lip, was removed and the wounds sutured as before. Figure 4, *F* and *G*, (April 10) shows the patient after this operation. The grafted surfaces appear surrounded by hemangiomatous tissue.

On August 20 part of the tumor over the left parotid region and left retroauricular region was removed. Hemostasis was obtained by ligating the larger vessels and suturing the wounds with silk.

On September 25 more tumorous tissue was removed from the suprahyoid, left submaxillary and parotid regions. On October 3 the raw surfaces over the left parotid region, upper lip and left cheek were covered with split grafts taken from the left thigh. Figure 4*H* (November 1) shows the patient at this stage.

On December 7 more of the tumor over the neck and lower lip was removed. On December 21 the raw surfaces above were grafted (Fig. 4*I*, December 23).

On Jan. 10, 1952, most of the tumorous tissue from the left ear was removed and the wounds sutured with No. 0 silk. Figure 4*K* shows the result on January 20. On March 5 small portions of hemangiomatous tissue left between the grafted areas over the left side of the face were removed. On March 19 the raw surfaces were grafted with skin from the left thigh.

Figure 4, *J*, *K* and *L*, shows the patient on Sept. 16, 1952, twenty-two months after the first operation. She had undergone sixteen operations, with gradual removal of angiomatous tissue and suturing; when this had produced a certain amount of scar tissue, removal of more of the angiomatous tissue was done. The wound was left to granulate, and skin grafting was done later.

There still remains a certain amount of the hemangioma over the face and neck, but the patient's appearance has greatly improved, and she no longer dreads appearing in public.

Actually, I am treating what remains of the tumor with sclerosing injections. This treatment I expect to continue also on the tumorous tissue of the oral cavity. I do not expect to treat the lesion over the scalp, as it is almost entirely concealed by the hair.

SUMMARY

The author reports 4 cases of giant hemangioma treated at various times by means of roentgen and radium therapy, sclerosing solutions and surgical intervention. Photographs of the patients at different stages of treatment are presented.

Hemangiomas, which develop at birth or soon afterward, have a more or less slow but very persistent growth and may attain huge proportions. Since spontane-

ous regression is uncommon, treatment should be started as early as possible.

ZUSAMMENFASSUNG

Der Verfasser berichtet über vier Fälle von übergrossen Hämangiomen, die zu verschiedenen Zsiten mit Röntgen-und Radiumbestrahlungen, Einspritzung sklerosierender Lösungen und chirurgischen Eingriffen behandelt wurden. Photographien der Kranken aus mehreren Perioden der Behandlung liegen vor.

Hämangiome, die bei der Geburt oder bald danach zur Beobachtung kommen, wachsen mit mehr oder minder grosser Geschwindigkeit, aber sehr beständig, und können grosse Ausmasse erreichen. Da spontane Heilungen ungewöhnlich sind, sollte die Behandlung so früh wie möglich einsetzen.

RESUMEN

El autor comunica 4 casos de hemangioma gigante tratados por medio de rayos roentgen y terapia con radium, soluciones esclerosantes e intervenciones quirúrgicas. Se presentan las fotografías de los pacientes diferentes épocas del tratamiento.

Los hemangiomas que se desarrollan en el nacimiento o poco tiempo después de él, tienen un crecimiento lento pero constante y pueden llegara tener gran tamaño.

Ya que su involución espontánea es rara, el tratamiento debe comenzarse lo más pronto posible.

SUMARIO

O autor comunica 4 casos de hemangioma gigante tratados em épocas diversas por meio da roentgen e curieterapia, soluções esclerosantes e intervenções cirúgicas. Fotografias do paciente nas diferentes épocas do tratamento são apresentadas.

Os hemangiomas, que se desenvolvem por occasião do nascimento ou pouco depois, têm um crescimento mais ou menos lento mas muito persistente e podem atingir proporções enormes. Uma vez que a regressão espontânea não é comum, o tratamento deve ser iniciado o mais breve possível.

RIASSUNTO

L'autore presenta 4 casi di emangioma gigante trattati in tempi diversi con roentgen e radium terapia, soluzioni sclerosanti e intervento chirurgico. Sono allegate fotografie dei pazienti nei differenti stadii. Gli emangiomi, che si sviluppano alla nascita o subito dopo—hanno un accrescimento più o meno lento ma molto persistente e possono raggiungere grosse proporzioni. Dato che è rara la regressione spontanea, occorrerebbe iniziare la cura il più presto possibile.

RÉSUMÉ

L'auteur reporte 4 cas d'hémangiome géant qui étaient traités à differentes périodes par radio-et radiumtherapeùtique, solutions sclérosantes et intervention chirurgicale. Des photos des malades à differentes étappes du traitement sont présentés. Des hémangiomes qui se dévéloppent à la naissance ou peu de tempts après croissent plu ou moins lentement, mais continuellement et peuvent atteindre des proportions énormes.

Puisque une régression spontane est rare, il faut commencer le traitement aussi tôt que possible.

Management of Villous Papillomas of the Lower Portions of the Sigmoid and the Rectum

RICHARD A. HOPPING, M.D., M.S., D.A.B.P., F.I.C.S.
EAST ORANGE, NEW JERSEY

THE medical literature is replete with references to this subject, and it is not my purpose to present a new method. Rather, I shall undertake the simple problem of discussing the lesion, the various instruments available and the "modus operandi" at hand, with the object of clarifying several interesting aspects of each. The workman with the most experience, the most tools at hand and the most thorough knowledge of each one's use is usually the most capable and useful artisan. Understanding, full adaptability, dexterity and a multiplicity of possible avenues of approach make for high technical skill and increase the surgeon's success.

Papillary (villous) adenomas of the lower part of the bowel are not rare. I can present no worth-while statistics as to the frequency of their occurrence, because my practice is restricted to my specialty and is completely on a referral basis. Consequently, the statement that they are not unusually rare must suffice. This interesting variety of intestinal polyp must be differentiated from the many others that occur in this location,[1] mainly because their origin, characteristics and potentialities are somewhat different from those of other tumors. Differentiation of these polyps from the simple (and much more common) adenomas is important. Simple adenomatous proliferation of the intestinal mucosa may produce three different gross tumor forms—the sessile, the polypoid (so-called "carpet" type) and the pedunculated polyps. Papillary adenoma, which is generally accepted as a "growth variant" of the simple adenoma, may likewise assume any of these forms. Personally, however, I have yet to encounter a villous adenoma on a very long and narrow pedicle.

Symptomatically, papillary adenomas may be suspected when the patient complains of rectal passage of large amounts of glairy mucus mottled with blood streaks. This abundance of mucus production is almost monotonously characteristic. True obstructive symptoms are seldom present—as a matter of fact, it has been remarked that patients harboring villous adenomas produce so much mucus that they literally give themselves an enema each day. Because of the large size these polyps occasionally attain, they sometimes initiate an intussusception, which may or may not become symptomatic to the point of actually being extruded through the

---

Submitted for publication Sept. 24, 1955.

anal orifice. When this does happen, such a prolapsed mass may easily be mistaken for large prolapsing hemorrhoids.

Grossly, the villous tumors present all the varied characteristics of size, shape and manner of attachment to the bowel wall that simple adenomas may possess. A distinct and constant difference is the consistency of the papillary adenomas, which are soft and velvety, imparting to the examining finger or palpating instrument the same sensation that would accompany palpating a spoonful of soft jelly on a matron's ample bosom. So soft, spongy and friable are these tumors that it is not unusual for the gentle examining finger or the deftly maneuvered sigmoidoscope to shear off peripherally located portions of the tumor mass during exploration and evaluation of the lesion. When the biopsy punch or forceps is brought into use, it is frequently impossible to bite off or snare a small piece of the tumor. The sharpest instruments are prone to tear these masses. It is easier to take a clean cut out of the center of a soggy lemon meringue pie than to remove a biopsy specimen neatly from these polyps. Curiously, and almost constantly, these tears do not result in profuse or dangerous bleeding. Most frequently sessile, with a broad pedicle or none, villous polyps are always fungating; and their surfaces are invariably wet and covered by a deep layer of glairy mucus. Additional, relatively large amounts of mucus may be "milked" from them by suction or pressure on the surface. Because of the great amount of mucus produced, I have entertained the idea that this peculiar type of polyp found its origin in proliferation of the goblet cells of the mucosa. Theories of an origin based upon abnormal growth of cells on the surface, as opposed to those in the depths of the crypts of Lieberkuhn, have never been too impressive to me. As yet, I cannot prove my own theory. At first glance, the mucosa around the polyp may appear normal. Closer scrutiny occasionally reveals irregularities in the form of tiny papillations. Microscopically, these may be villous tumors, also. The examiner must be careful to evaluate and assess this variable-sized "halo" of not entirely normal mucosa surrounding the villous adenoma. The significance of this "halo zone" must be appreciated, since it *will influence the methods and scope of* subsequent management. In my opinion, if it is ignored, recurrence of these persistent lesions is practically insured. Furthermore, the existence of this zone of change is a strong argument for continued follow-up examination of the patients after treatment has been completed or is *believed* to have been completed.

Villous papillomas have a decided tendency to differentiate further into outright malignancy.[2] Microscopically, atypism is almost constant. Marked atypism, so-called carcinoma *in situ*, is not uncommon. Outright invasive carcinoma is observed in 1 in 10 of these tumors and frequently is of the colloid or signet-ring type. This change (i.e., to malignancy) is constantly attended by a change in the consistency of the part of the tumor involved. A plaque or nodule of increased density and firm consistency is palpable. Proof positive of this situation by biopsy immediately reclassifies the tumor out of the scope of this presentation.[3] Such reclassification must be unhesitatingly made whenever invasive carcinoma is detected. It cannot be too strongly emphasized that carcinoma must be treated by radical resection and not by local destruction or excision.[4]

When a papilloma has been discovered in the colon, it is important to survey the entire large bowel minutely for other lesions. The incidence of the multiple lesions is appreciable and cannot be ignored. Thorough sigmoidoscopic study and painstaking search with barium enemas are required. Neither procedure by itself is satisfactory. Each examination complements and overlaps the other, but neither is satisfactory alone.

Prolonged observation, "expectant treatment" or "judicious neglect" has no place in the armamentarium of the proctologist who treats these lesions. They must be treated, and there are many approaches to the problem. The fisherman who has but one dry fly on his hat brim is indeed handicapped. So is the surgeon when he knows and understands but one approach to the problem of separating the patient from his villous adenoma. "To each his own technic" is certainly a comforting thought; nevertheless, thorough understanding and adeptness in all of the many technics available are much more desirable. Each possible type of intervention has its strong as well as its weak points, and one should be familiar with them all.

When the proctologist is assured as to the status of the entire large bowel, he can proceed with treatment of the benign papilloma. (It is well to regard all such lesions as malignant until they are proved otherwise.) There are several factors to be considered at this time, the first of which is the size of the tumor. Removal or destruction of the lesion from below is feasible with most of these lesions. This statement is naturally limited by the experience, ingenuity and dexterity of the surgeon. The size of the pedicle in relation to the circumference of the bowel lumen is a further qualification. In general I have observed that, when the size of the pedicle is approximately a half or less than half the circumference of the bowel lumen, excision, loop excision *en masse* or morselation or fulguration destruction can be accomplished without difficulty. The actual bulk of the polypoid growth itself is not of great significance in this respect. The pedicle or base is the only factor to be considered.[4b]

The location of the pedicle in relation to the polyp is another prime factor. Ideally the polyp should arise from the posterior wall of the rectum in the hollow of the sacrum. Posteriorly, locations even higher than the promontory of the sacrum are comparatively secure. The dangers of perforation and hemorrhage are minimal. The lateral walls of the rectum are not so immune to these dangerous complications, and the anterior wall is even less so. These problems are canceled to some extent by the ease of visualization to the lateral and especially the anterior rectal walls. It might be categorically stated that the higher the lesion the less is the possibility of satisfactory removal from below. Loop coagulating methods or ligation and fulguration procedures are used more and more frequently and are completely satisfactory in most cases.

The choice of procedure must of course depend, again, upon the experience and preference of the individual proctologist. Trans-sigmoidoscopic procedures are most frequently used. Fulguration is used most of the time. I prefer the unipolar oudin type current[6] and set the apparatus to produce a spark of approximately 5 mm. The lesion must be fairly dry and the bowel clean and exhausted of possible explosive gases. Dr. George Becker of Paterson, New Jersey, has devised an excellent and simple system for the use of nonexplosive gas, which obviates the possibility of explosion. The fulgurating tips should ideally not come into contact with the lesion itself, because of the decided tendency of the tissues to fuse to the tip. If this fusion occurs, it is frequently difficult to separate the two without producing undue bleeding. It must be remembered that this procedure produces much intense and penetrating heat, which can easily damage distant tissues. Lesions more than 2 cm. in diameter are frequently fulgurated in stages a day or a week apart.

Biopsy specimens should be taken at the time of each treatment.

Wire loop resectors of many different types are available, and the selection is entirely a matter of choice. I prefer a fine wire loop and use a coagulating type of current. After the tissue is engaged properly in the loop of the resector, it is of paramount importance to proceed deliberately. The coagulating current is turned on and the loop closed very, very slowly. This is the best safeguard against bleeding. The wire does the cutting, and the current controls the bleeding. Small tumors may be removed *in toto.* Larger lesions can be morselated. Neither radon seeds nor irradiation has ever been used in my office.

Selected mobile polyps can occasionally be excised by the clamp and ligature method through an anoscope or after they have been procidented through the anus without anesthesia. For the most part, however, excisions from below require anesthesia. Caudal-transacral block is preferable in most cases. If general anesthesia is used, it is probably best to intubate the patient. Any one of the prone positions is preferred in all procedures in which the approach is through the anal canal.

When the base of the polyp is too large in relation to the diameter of the bowel or the lesion is too far above the anal orifice, a bowel resection must be done. Adequate chemical preparation of the bowel is necessary, and mechanical cleansing is obligatory. The type of anesthesia is a matter of choice. I am firmly convinced that the best procedure is a resection of the "sleeve" type. Performance of a simple colostomy and excision of a small cuff of surrounding mucosa with the polyp are probably completely adequate. Resection of a complete segment of bowel, however, apparently does not increase surgical morbidity appreciably; at the same time, it lessens the possibility of recurrence in neighboring areas. The extensiveness of the resection is dependent upon the polyps and the surgeon. In an occasional case it may be necessary to resort to some form of proctosigmoidectomy with a permanent abdominal colostomy, or a "pull through" procedure as has been so well developed by Dr. Bacon.

CONCLUSION

Management of the patient with a villous papilloma does not stop with the removal of the polyp.[8] The literature and our experience are full of object lessons that severely contraindicate such an abrupt cessation of care. Seldom is it the fault of the patient when follow-up observation is not pursued. Most intelligent persons will adhere to a regime of postoperative visits to the doctor. Proctologists would do well to examine these patients sigmoidoscopically a month after healing is complete and then at three-month to six-month intervals for an indefinite period. I advocate, in addition, an annual or twice-annual roentgen examination of the bowel.

SUMMARY

The management of villous papillomas of the lower sigmoid and rectum is presented, and an attempt is made to demonstrate the varying interrelation existing among the tumors, the patients and the individual doctor's preferences with regard to treatment. The importance of complete understanding of the problem by the patient as well as the doctor is stressed, as is the necessity of continuous follow-up observation.

ZUSAMMENFASSUNG

Es liegt eine Erläuterung der Behandlung zottiger Papillome des unteren Sigmas und des Mastdarms vor. Der Ver -

ser versucht, die wechselnden Beziehungen zwischen der Erkrankung, dem Kranken und der von verschieden Ärzten persönlich bevorzugten Behandlungsmethode aufzuweisen. Er unterstreicht die Bedeutung völligen Verständnisses des Problems seitens des Kranken sowie des Arztes und weist auf die Notwendigkeit ständiger Nachuntersuchungen hin.

RÉSUMÉ

Le traitement des papillomes villeux du Sigmoid inférieur et du rectum est présenté et l'auteur essaye de démonstrer les différentes rélations qui existent entre les tumeurs, les malades et la méthode de traitement préférée par le docteur. L'importance de comprendre ce problème complètement du coté du malade et du docte ur est mis au point et la nécessité d'une observation conntinue postopérative.

RIASSUNTO

La cura dei papillomi villosi del colon discendente e del retto è stata trattata sotto l'aspetto dei vari legami che esistono fra questi tumori, il paziente e le preferenze dei vari medici in rapporto ai diversi metodi di cura. Una completa conoscenza del problema è indispensabile, come pure un controllo prolungato dei malati.

REFERENCES

1. Sunderland, D. A., and Binkley, G. E.: Papillary Adenomas of the Large Intestine, Cancer 1: 184 (July) 1948.
2. Bacon, H. E.; Laurens, J., and Peal, A. R.: Histopathology of Adenomatous Polyps of Colon and Rectum, etc., Surgery 29:663-667 (May) 1948.
3. Cattell, R. B.: Surgical Treatment of Polyps of the Large Intestine, Am. J. Surg. 76:733-747 (Dec.) 1948.
4. (a) McLanahan, S.; Grove, G. P., and Kieffer, R. F.: Conservative Surgical Management for Certain Rectal Adenomas Showing Malignant Change, J.A.M.A. 141:822-826 (Nov. 19) 1949. (b) Binkley, G. E., and Sunderland, D. A.: Diagnosis and Treatment of Papillary Adenomas of the Rectum, Am. J. Surg. 65:365-368 (Feb.) 1948.
5. Green, W. W.: The Treatment of Benign Tumors of the Colon and Rectum, Southern M. J. 47:365-371 (April) 1954.
6. Buie, L. A.; Smith, N. D.; Jackman, R. J., and Hill, J. R.: Polypoid Lesions of the Terminal Portion of the Colon, J.A.M.A. 139:702-709 (March 12) 1949.
7. Binkley, G. E.; Sunderland, D. A.; Miller, C. J.; Stearns, M., and Deddish, M. R.: Carcinoma Arising in Adenomas of Colon and Rectum, J.A.M.A. 148:1465-1469 (April 26) 1952.

How ruinous a farm hath man taken, in taking himself! How ready is the house every day to fall down, and how is all the ground overspread with weeds, all the body with diseases; where not only every muscle of the flesh, but every bone of the body hath some infirmity; every tooth in our body such a pain as a constant man is afraid of, and yet ashamed of that fear. How dear and how often a rent doth man pay for his farm! He pays twice a day, in double meals, and how little time he hath to raise his rent! Every day is half holiday, half spent in sleep.

—*Donne.*

Reticulum Cell Sarcoma of the Ascending Colon

LOUIS STEINGER, M.D., F.I.C.S.

AND

IRVING S. SCHLACHTER, M.D.

BROOKLYN, NEW YORK

RETICULUM cell sarcoma of the large intestine is uncommon. The diagnosis presents considerable difficulty, and it is of the utmost importance from the standpoint of early and effective treatment. We should like to present the record of a patient in whose case a diagnosis of primary reticulum cell sarcoma was established.

Until recently, malignant tumors arising in the lymphoreticuloendothelial system had been classified as reticulum cell sarcoma, Hodgkin's granuloma or sarcoma, giant follicular lymphoblastoma, or small cell or lymphoblastic lymphosarcoma. Characteristically, these tumors undergo complete change in their cellular structure as serial biopsies are performed.[1] Furthermore, two or more histologic patterns may co-exist in one patient. Lame and his co-workers[2] regarded the entire group as a single neoplastic entity under the heading of malignant lymphoma, to include the following types: follicular, lymphocytic, reticulum cell and Hodgkin's. Clinically, for the most part, the individual members of this family behave ultimately in the same fashion.

REPORT OF CASE

C. D., a white married woman aged 53, was admitted to Prospect Heights Hospital in July 1955, with a history of pain of three months' duration in the right lower quadrant of the abdomen. There was no nausea or vomiting. No anorexia or loss of weight was noted. There was no change in bowel habit, no constipation, no diarrhea and no melena. The family history was essentially normal.

On examination, the head and neck revealed nothing remarkable. There was no cervical adenopathy.

The respiratory, cardiovascular and central nervous systems showed no abnormalities. The liver and spleen were not palpable. No abnormal intra-abdominal masses were felt on palpation, nor was there any tenderness or rigidity. A well-healed abdominal scar from previous operations on the gallbladder and the appendix was noted.

The inguinal lymph nodes were not enlarged. Pelvic examination gave negative results. Sigmoidoscopic examination (up to 25 cm.) revealed no abnormality.

The erythrocyte count was 3,850,000 per cubic millimeter of blood, with 11 Gm. of hemoglobin and a color index of 0.8. The leukocyte count was 7,200 per cubic millimeter, with adequate platelets and a differential count of 66 per cent polynuclear cells, 1 per cent band cells, 1 per cent eosinophils, 25 per cent lymphocytes and 7 per cent monocytes. The Wassermann and Kahn reactions were negative, as was the result of a benzidine test for occult blood.

About one year earlier the patient had been hospitalized for pain in the right upper quadrant of the abdomen. At that time a gastrointestinal series was normal except for numerous small opaque areas in the right upper quadrant, which were interpreted as biliary calculi. There was no obstruction to the passage of barium through the gastrointestinal tract. A barium enema was performed on the following day and showed an intraluminal filling defect at the hepatic flexure of the colon. The patient was subjected to cholecystectomy, appendectomy and careful exploration of the intestine. At that time the cecum, the ascending portion of the colon, the ileum and the hepatic flexure were normal to the palpating hand. The aforementioned roentgenographically demonstrable filling defect was

---

Submitted for publication Nov. 22, 1955

interpreted, in retrospect, as due to a fecal impaction. There was neither gross nor microscopic change in the appendix.

A second barium enema was performed one month after the operation, and the colon filled completely, without obstruction. There was a slight deformity about the cecum and the terminal portion of the ileum, which was interpreted as ileocecal adhesions in view of the previous operative picture.

Roentgenographic and fluoroscopic examination of the large intestine after a barium enema on July 5 revealed filling of the entire colon, cecum and terminal portion of the ileum.

The cecum and the ascending portion of the colon were spastic and showed some irregularity of the mucosal contours, with what appeared to be polypoid changes in the wall of the proximal half of the ascending portion of the colon (Fig. 1*A*).

After evacuation of the barium enema the polypoid changes were still demonstrable in this area (Fig. 1*B*).

Air contrast study of the colon showed it to be well distended, except for a slight narrowing at the hepatic flexure. A suggestion of a polypoid mass in the lateral wall of the ascending colon was once again noted. The terminal portion of the ileum was normal (Fig. 1*C*).

It was concluded that there was an intramural pathologic process involving the wall of the proximal portion of the colon.

At operation, the cecum, the terminal part of the ileum and a portion of the ascending colon were involved in a pathologic process suggestive of malignancy. Twenty-five cm. proximal to the ileocecal juncture the ileum was kinked at right angles and adherent to the ascending portion of the colon. There was a fistulous communication between the ileum and the colon at this point. Regional and distant lymph nodes were not grossly abnormal. The liver and the remainder of the abdominal cavity were not remarkable. Ileoileostomy, right hemicolectomy and ileotransverse colostomy were performed, thus eradicating the colonic mass together with the fistulous tract from the ileum. Convalescence was uneventful. In Figure 2, a photograph of the gross specimen, the arrows indicate nodules that invade the lumen, and the probe is seen inserted through the fistulous tract. In Figure 3*A*, a low power photomicrograph, the invasion of lymphoid tissue is shown. The high power photomicrograph (Fig. 3*B*) revealed that this area of the intestine had been replaced by sheets of atypical reticulum cells, characteristic of reticulum cell sarcoma.*

COMMENT

Malignant lymphomas of the gastrointestinal tract are observed with relative infrequency as compared to carcinoma.[3] In the reports of those occurring in the gastrointestinal tract, the rarest site of origin was the colon. In 49 cases reported by Warren and Littlefield[4] only 2 arose in the cecum. Migliaccio and Pahigan,[5] in their

---

*The surgical specimen was prepared and reviewed by Dr. Silik Polayes, Pathologist, Prospect Heights Hospital.

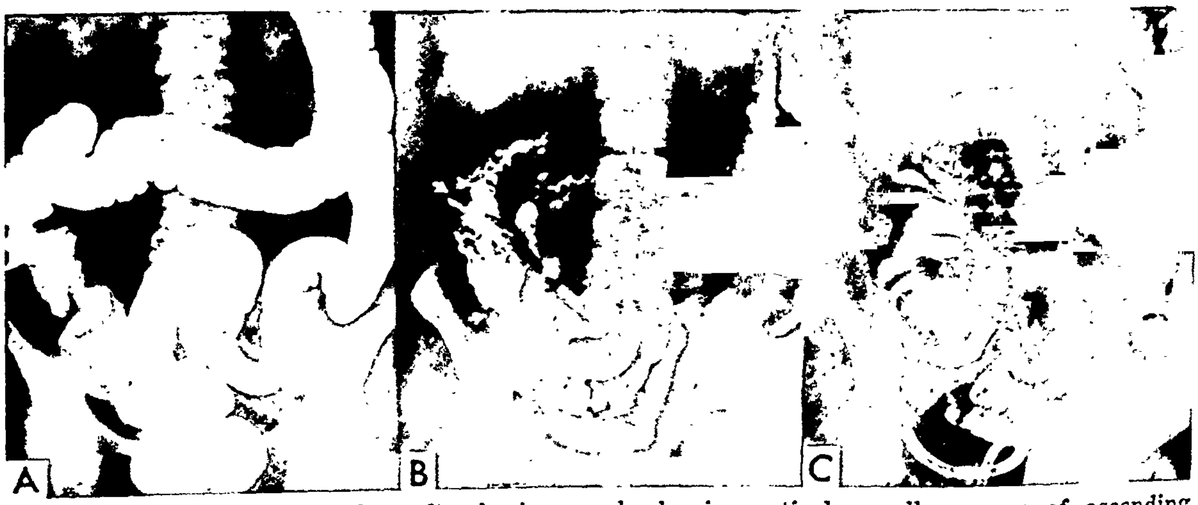


Fig. 1.—*A*, roentgenogram taken after barium meal, showing reticulum cell sarcoma of ascending portion of colon. *B*, film taken after evacuation. *C*, air contrast film.

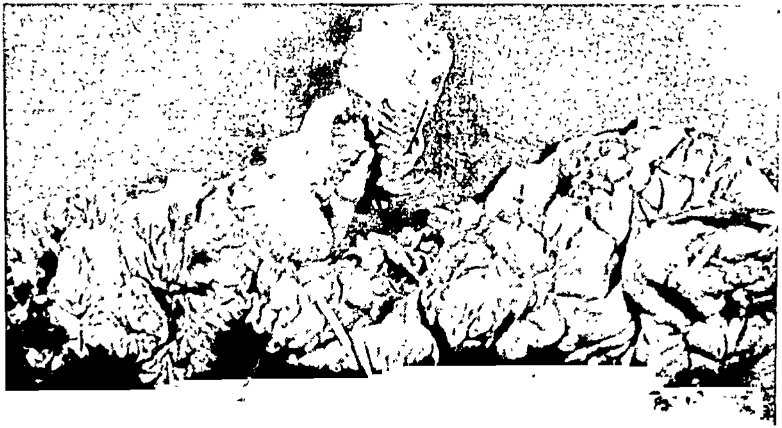


Fig. 2.—Photograph of gross specimen, showing solitary lymph nodules and fistulous tract.

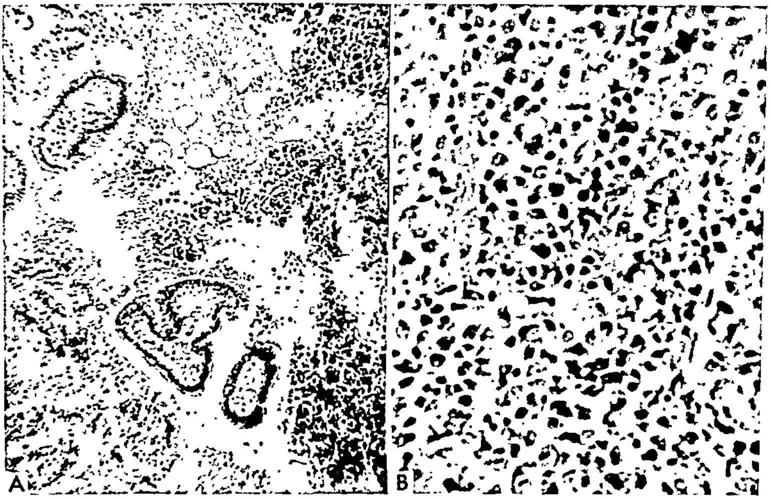


Fig. 3.—*A*, low power photomicrograph showing tissue invasion. *B*, high power photomicrograph showing atypical reticulum cells.

series of 36 reported cases, described only 5 in which the lesion arose in the large intestine, while in 22 cases reported by Lame, Velat and Custer[2] only 2 arose in the colon.

These tumors are not characterized by any typical clinical course. The symptoms are those one would expect in connection with obstruction or infiltration—pain, a palpable mass, loss of weight, change in bowel function and possibly acute or chronic peritonitis.

The diagnosis of lymphoma of the colon is usually established after surgical removal and histologic examination of the tumor.

When the possibility exists that the tumor has not become disseminated, operation remains the treatment of choice. There are those who prefer to use irradiation as an adjunct to removal of the primary lesion even when there is no gross evidence of spread, in the hope of eliminating microscopic seedings not yet obvious. Surgical excision in the presence of distant metastases is employed as a palliative procedure to prevent anticipated intestinal obstruction.

When widespread involvement is present, therapy with intravenous nitrogen mustard, oral triethylene melamine and irradiation has been employed, often with remarkable amelioration, sometimes for prolonged periods.[6] Unfortunately, there is no exact correlation between the microscopic appearance of the lymphoma and its response to any of the aforementioned oncolytic agents; therefore, one must try each in turn before deciding on the ultimate refractoriness of the lesion.

SUMMARY

The case of a woman with reticulum cell sarcoma of the ascending portion of the colon is reported. The results of operation, up to the time of writing, are successful. Some pertinent facts concerning this rare pathologic entity are presented.

ZUSAMMENFASSUNG

Es wird über eine Patientin mit Retikulumzellsarkom des aufsteigenden Dickdarms berichtet. Zur Zeit der Niederschrift der Arbeit war der Erfolg der Operation günstig. Es wird auf einige wesentliche Punkte im Krankheitsbild dieses seltenen Leidens hingewiesen.

RIASSUNTO

E' riportato il caso di una donna con un reticolo sarcoma della porzione ascendente del colon. Al momento della relazione i risultati della operazione sono soddisfacenti. Sono inoltre presentati alcune caratteristiche che distinguono questa rara malattia.

SUMARIO

O caso de uma mulher com sarcoma de celula reticular da porção ascendente do colon é relatado. O resultado de operação até o momento é satisfatorio. Alguns fatos, pertencentes a esta rara entidade, mórbida, são apresentados.

RÉSUMÉ

Le cas d'un sarcome de cellules reticulaires du colon ascendant chez une femme est reporté. Le résultat de l'opération jusqu' au moment de ce report était un succès. Quelques faits importants de cette condition rare sont presentés.

REFERENCES

1. Custer, R. P., and Bernhard, W. G.: The Interrelationship of Hodgkin's Disease and Allied Tumors, Am. J. M. Sc. 216:625, 1948. Custer, R. P.: Borderlands Dim in Malignant Disease of the Bloom Forming Organs, Radiology 61:764, 1953.

2. Lame, V., and Custer, R. P.: On the Diagnosis of Malignant Lymphoma of the Gastro-Intestinal Tract, Ann. Int. Med. 40:1, 1954.

3. Weston, S. D.: Personal communications.

4. Warren and Littlefield: Malignant Lymphomas of the Gastro-Intestinal Tract, Surg. Clin. North America, 35:944, 1955.

5. Migliaccio and Pahigan: Malignant Lymphoma of the Gastro-Intestinal Tract, Rhode Island M. J. 31:26, 1951.

6. Lichtman, H. C.: Personal communications.

Surgery of the Thyroid and Parathyroids

Periodic Paralysis Associated with Graves' Disease

Studies of Three Cases

SHIRO HAYASHI, M.D.
TOYKO, JAPAN

PERIODIC paralysis, characterized by a unique and impressive muscular paralysis, has always been one of the most peculiar and obscure phenomena confronting the clinician. Periodic paralysis was first described in 1727 by Musgrave, and several hundred cases have since been recorded in the literature. Most authors have emphasized the hereditary nature of this disease.

As a rule the onset of this type of paralysis occurs in adolescence, and the attack commences, usually without prodromal symptoms, in one or several extremities and extends in a regular fashion, originating in the lower extremities and extending to the upper. There is a typical pattern, and the severity of the palsy may vary from mild weakness of one muscle group to profound quadriplegia with respiratory paralysis. In individual patients the pattern may vary tremendously in extent and severity from attack to attack. Generally paralysis appears during or after sleep. The muscles supplied by the cranial nerves are spared, a fact of considerable significance in differentiating this paralysis from myasthenia gravis. On examination during an acute episode, the positive manifestations are confined to flaccid paralysis, with diminution or loss of tendon reflexes in the involved extremities. Sensory and mental functions are unimpaired. The paralysis tends to become less severe with age. Many authors have reported abnormal metabolism of carbohydrate, reduction of the serum potassium content and abnormalities in the electrocardiogram during the paralytic phase. The therapeutic effect of administration of potassium has been noted, as well as a relation to thyroid and adrenal cortical function. These observations, however, have not been completely accepted by all authors. Several have held contradictory opinions with regard to abnormal metabolism of potassium as the pathognomonic feature of this disease.

Observations on the possible relation between periodic paralysis and endocrine disturbance were made early. In 1926 it was emphasized by Shinosaki. The simultaneous occurrence of hyperthyroidism and periodic paralysis in the same patient is rare, although Shinosaki, Schoenthal, Morrison and Levy, Dunlap and Kepler, Talbott, Hildebrand and Kepler, Mamou and others have noted the relation between periodic paralysis and exophthalmic ter. In Millikan and Haines' classifica of thyrotoxic myopathic conditions, pe

---

From the First Surgical Department, Tokyo University School of Medicine, Tokyo.
Submitted for publication Sept. 21, 1955.

odic paralysis and myasthenia gravis are included. Although the existence of this relation has been recognized by many authors, it is still not known what role the function of the thyroid gland plays in the causation of this type of paralysis. Recently I have observed 3 cases of this combination (periodic paralysis and Graves' disease) which, added to previous cases, make up a total series of 11 cases in which the patients were admitted to the First Surgical Department of Tokyo University from 1937 to 1948. None of these had a family history of periodic paralysis.

CASE 1.—A Japanese housewife aged 45 was in her usual state of health until January 1949, when hyperthyroidism appeared gradually. Since September 1949 she had had several attacks of flaccid paralysis or weakness of the extremities, especially the legs, associated with dyspnea, palpitation, cold sweats and double vision. These symptoms usually disappeared completely by the next morning. In October the patient noted slight enlargement of the thyroid gland and was treated by her local physician, with improvement. Attacks of periodic paralysis of the extremities persisted, however, and she was admitted to the hospital in October 1949. At the time of admission she showed the typical picture of Graves' disease. During hospitalization the attacks of paralysis occurred every night. The flaccid paralysis of the extremities was reproducible by the autonomic nervous function test with epinephrine. It appeared in the proximal portion of the extremities thirty-five minutes after the injection and persisted for approximately thirty minutes. Such an attack could not be induced by an injection of pilocarpine. The fructose tolerance level was normal, but the patient noted some weakness or a fatigued sensation in both thighs three minutes after taking fructose by mouth, with spreading of weakness to the legs and arms. This was followed by fullness in the stomach and a dull feeling in the chest, and the patient could not sit up because of complete flaccid paralysis of the extremities after ten minutes. This paralysis was bilateral and was evidenced in the proximal region. The tendon reflexes were diminished, but there were no pathologic reflexes, and no sensory deficiency was noted. At thirty minutes the intensity of paralysis was maximum and was associated with some difficulty in moving the neck and moderate paralysis of accommodation. The paralysis improved gradually in the reverse order of onset.

During these attacks there was no cardiac arrhythmia, and no acetic acid or sugar could be detected in the urine. In no attack was any reduction of the serum potassium content noted. No abnormalities were present in the electrocardiogram during either induced or spontaneous attacks. The thyrotoxic symptoms were markedly improved by administration of methylthiouracil and Lugol's solution, but the attacks of paralysis persisted. A subcapsular, subtotal thyroidectomy was performed and a hypertrophied thymus removed. The postoperative course was uneventful and the patient has had no further attacks.

Microscopic examination of the hypertrophied thymus showed many Hassall corpuscles, rather large, and there was hyperplasia of lymphocytes with invasion of the fat tissue.

CASE 2.—A 26-year-old Japanese man had noted several symptoms of Graves' disease since May 1947, and removal of the left lobe of the thyroid gland was performed in 1949. The symptoms became worse after the operation, and typical attacks of periodic paralysis developed in May 1950. These attacks occurred as often as ten times a month. On admission to the hospital, in June 1950, the patient showed typical symptoms of Graves' disease. Although treated with methylthiouracil, he had attacks of paralysis every night, especially when he ate large amounts of rice for supper. In these attacks he first noticed weakness or fatigue sensations and then flaccid paralysis of the thighs, a feeling of fullness in the abdomen and inability to contract the abdominal muscles. This caused some difficulty with urination. Inspiratory movements became rather labored, and then flaccid paralysis of the upper extremities was noted moving from above downward. During severe attacks the patient had some paralysis in the neck muscles. The deep reflexes in the involved extremities were lost, but no sensory deficiency was revealed. The patient had such attacks five times during hospitalization. The first attack in the hospital was on the fourth day after admission, before he had had antithyroid medication. The second and third attacks came immediately after administration of methylthiouracil was begun, and the fourth attack appeared when methylthiouracil was discontinued experimentally for two days. The last attack occurred in a period of clinical improvement but when the goiter was rather large.

TABLE 1 (Case 1).—*Electrolytes in Serum of Woman Aged 45*

	Ca. (mEq/L)	Mg. (mEq/L)	K. (mEq/L)	Na. (mEq/L)
Interseizure 11-14-50	4.6	2.0	5.1	110
Induced seizure 11-21-50	5.7	1.7	6.4	107
Spontaneous seizure 11-23-50	5.2	1.8	5.4	103
Postoperative 12-17-50	5.6	1.7	4.7	120

Laboratory Data.—1. *Basal Metabolic Rate:* Although this was not much reduced by administration of methylthiouracil, the patient improved clinically and had fewer attacks of periodic paralysis preoperatively and none after the operation. 2. *Electrolyte Determination:* As shown in the table, the serum potassium level was normal during the interseizure period, but a definite reduction of serum potassium was observed during attacks. I observed a reduction of serum potassium even in the interseizure period, when typical attacks appeared frequently. 3. *Electrocardiogram:* In the interseizure periods the electrocardiogram was of normal pattern, but when the serum potassium was reduced low T waves were recorded. After resection of the enlarged gland all symptoms were improved, the basal metabolic rate was reduced to normal, and the periodic paralysis did not reappear. No hyperplasia of the thymus was observed in this case.

CASE 3.—A 26-year-old Japanese housewife had shown signs of hyperthyroidism since June 1952, and had had several attacks of periodic paralysis in July, especially when she ate heavily. A goiter was present and was treated with methylthiouracil by her local physician in August. Improvement of symptoms followed. The patient was then admitted to the hospital for surgical treatment. After entering the hospital she had no attacks of periodic paralysis. Various kinds of adrenocortical function tests were performed. The Robinson-Kepler-Power test gave a negative result. Reduction of the eosinophils count after injection of epinephrine was 56 per cent, and excretion of seventeen ketosteroids in the urine averaged 10.5 mg. daily. The patient was subjected to subtotal thyroidectomy and had an uneventful postoperative course. No persistence or hyperplasia of the thymus was observed in this case.

It is difficult to come to any conclusions concerning the cause of this disease from the foregoing data, but, since reports concerning periodic paralysis associated with hyperthyroidism in the literature are rather rare, I have presented the cases and offer the following discussion:

The disorder known as familial periodic paralysis has been extensively studied since Cavare (1853), Westphal (1885) and Goldflam (1890) made their original

TABLE 2 (Case 2).—*Electrolytes in Serum of a Man Aged 26*

	Serum (mEq/L) Ca.	Mg.	K.	Na.	Cl.	HPO_4.	Urine (mEq) Cc.	Cl.
Interseizure 6-12-51							3,700	
Seizure 6-13-51	4.9	1.8	2.9					
Interseizure 6-14-51	5.1	1.5	3.2					
Interseizure 6-17-51	6.3	2.0	4.1	116	109	2.1	3,000	274
Interseizure 6-18-51	5.2	1.4	4.3	88	114	2.2	3,900	291
Seizure 6-23-51			3.2				3,900	256
Postoperative 7-15-51			4.6	130	104		1,700	

observations and Hartwig classified this disorder as intermittent spinal paralysis. The disease is rather rare, only a few more than 400 cases having been reported in the literature.

Summarizing these reports, one can pick up several special problems for discussion. 1. In most cases the disease is familial and hereditary. 2. Disturbances in the carbohydrate metabolism and electrolyte balance in patients were observed by some authors, who emphasized the existence of a lowered serum potassium concentration during attacks. 3. Transitory changes in the electrocardiogram during attacks have some relation to the lowered serum potassium. 4. The existence of factors concerned with various endocrine glands, especially the thyroid, is evident.

In the First Surgical Department of this hospital I have never observed a case of familial hereditary periodic paralysis. But, since there were 11 cases in which Graves' disease or hyperthyroidism was present in addition to the 3 cases here reported, it is desirable to direct attention to the peculiar features of these cases from the clinical and laboratory point of view.

A few authors have discussed the existence of the thyroid factor in familial hereditary cases, but it is rare to find cases of this disorder accompanied by Graves' disease or goiter.[1] Talbott,[2] Herrington[3] and Gass and others[4] stated that in about 80 per cent of their cases the familial element was present, and Oliver[5] and Tyler[6] and their co-workers described the hereditary factor as a "simple mendelian dominant with complete penetrance but with varying manifestation."

Sporadic cases without the hereditary factor have been reported, and in most cases of associated thyroid disease there has been no hereditary influence. All 14 cases in the First Surgical Department of Tokyo University fall into this category. As there is no remarkable difference in clinical or laboratory data between the hereditary condition and the condition associated with thyroid disease, it is considered that the same mechanism observed in the hereditary types produces this disorder in the cases in which thyroid or polyglandular disease is present. There were occasional cases of this syndrome associated with myasthenia gravis, myotonia congenita or progressive muscular dystrophy,[7] and Millikan classified this syndrome accompanied with thyroid dysfunction as a thyrotoxic myopathic condition.

Several authors have stated that the main cause of the syndrome is dysfunction of the contractile mechanism of muscles as described by Ziegler and that hereditary and thyroid factors may have some relation to this dysfunction. It is difficult to decide, however, whether this dysfunction of muscle contractility is due to a myoneural mechanism as mentioned by Allott and his associates[8] or Pudenz and his colleagues.[9]

Relation of Reduction in Serum Potassium to the Attack.—The relation between the reduction of the serum potassium level and the attack has been a focal point in study of the pathogenesis, and these studies have given impetus to research on this disorder. As early as 1901 Buzzard used potassium (KBr) in periodic paralysis, but he actually considered the treatment as the effect of bromide. In 1934 Biemond and Daniels[10] noted low levels of serum potassium in an attack. Since then there have been numerous reports of the reduction of serum potassium during attacks.[11] The fact that potassium by mouth or intravenously relieves attacks has been noted frequently. There are many reports on the paralytic effect of insulin, of sugar, or of dextrose and insulin, which lower the serum potassium level. Aitken[12] suggested that lowering of the serum potassium level either blocks neuromuscular transmission or inhibits the contractile response in muscles. Since in normal controls dextrose, insulin, epinephrine or DOCA lower this level without causing any clinical symptoms, however, one must conclude that patients with this disorder have abnormalities both in the metabolism of potassium and in neuromuscular mechanism.

It is interesting that potassium chloride produces no effect against attacks if not given into the general circulation. Although in most reported cases a lowered level of serum potassium has been observed during paralytic attacks, there are a few reports in which no change took place in the serum potassium level.[13]

In Case 1 of this series there was no change in the serum potassium level or in the electrocardiogram during seizures or interseizure periods. One must reconsider the relation of potassium to periodic paralysis in the light of the following facts: The severity of attacks of paralysis does not necessarily parallel the reduction in serum potassium,[13] and there is no definite relation between the rise and fall of attacks and the potassium serum level.[11b] Even when paralysis is improving clinically, low levels of serum potassium have persisted in some cases. In the second case of my series the reduction of serum potassium was revealed during attacks and persisted even in the interval when attacks appeared frequently. In cases of this condition associated with Graves' disease, no attack could be produced by any of various kinds of stimulation immediately after thyroidectomy. Apparently, therefore, fluctuation of the serum potassium level is not essential to this disorder but merely a concomitant or associated phenomenon.

Several authors have noted that the low level of serum potassium was due not to loss from the body but rather to a migration of potassium from the blood into the extravascular space. It is interesting that there is no change of the potassium level in the cerebrospinal fluid, even when there is definite reduction during attacks.[4]

During the seizure, oliguria and a decrease of urinary excretion of sodium chloride are observed, and after the seizure a compensatory increase;[9] also, there occurs a slight abnormality in the metabolism of creatine, creatinine, phosphate and carbon dioxide.[14] In Case 2 of my series there was a definite increase of urinary excretion of sodium chloride during the period of frequent seizures.

The Electrocardiogram and Periodic Paralysis. — Study of the electrocardiogram in an attack of periodic paralysis reveals a defect in the propagation of the excitation wave (Wolf[15]), a marked impairment in auriculoventricular conduction and flattening of the T waves (Wolf[15]). These changes may be due to the low level of serum potassium. In my series the electrocardiographic changes were parallel to the migration of serum potassium. There were no changes in the electrocardiogram in Case 1, and no change in the serum potassium level. In Case 2 a decrease in the height of the T waves was associated with the reduction of serum potassium during seizures.

The Thyroid and Periodic Paralysis.— Observations concerning the possible relation between periodic paralysis and hyperthyroidism,[16] including those of Shinosaki, in 1926, have stressed the relation between periodic paralysis and the glands of internal secretion, especially the thyroid gland. Cases in which thyroid disease is present are, in general, sporadic, and there are few cases of the hereditary condition associated with hyperthyroidism. In 1 reported case of hereditary periodic paralysis, hyperthyroidism developed.[17] It was observed that attacks of paralysis increased as the hyperthyroidism grew worse and that the seizures could be activated by the administration of desiccated thyroid. Thyroidectomy, roentgen therapy and thiouracil were effective against the seizures.

Dunlap and Kepler[1a] attempted to explain the mechanism of the thyroid factor by postulating that: (1) either Graves' disease or hyperthyroidism precipitated the appearance of seizures in "latent cases" or (2) there is some physiologic or chemical change in the muscles of patients with Graves' disease which has a direct relation to the occurrence of seizures. Millikan and Haines[1f] supported the former explanation.

Wolf[15] expressed another opinion concerning the thyroid factor. He noted that thyroid substance neutralizes or prevents the onset of the seizure of periodic paralysis. The hyperthyroidism that develops in the course of periodic paralysis is not a factor in the pathogenesis of paralysis so much as it is a compensatory reaction on the part of the organism to alter the physiologic aspects of the intracellular and extracellular potassium—in this sense an attempt to relieve the seizure. Arguing against the existence of a thyroid factor, Morrison and Levy[16b] stated that there is no causative relation between thyroid disease and paralysis and that the two conditions exist in some patients coincidentally. My observation in all cases of my series is that therapeutic procedures against the thyroid gland are effective in eliminating the seizures of periodic paralysis and that the hereditary factor is not present in all cases. I am convinced that there exists a thyroid factor alone in some cases of this disorder. I cannot easily agree with Wolf's opinion, because thyroidectomy is effective in preventing attacks even immediately after the operation, and postoperatively no attacks can be precipitated by various methods of stimulation. I can detect no difference, clinically, between the hereditary condition and that secondary to hyperthyroidism.

It has been observed that there are similarities between periodic paralysis and myasthenia gravis and that the pathogenesis of the muscular weakness in the two conditions may be similar.[18]

There are a few reports describing hypertrophy or persistence of the thymus in cases of this disorder,[19] and 2 of my own cases included this phenomenon. There is also a report of a hypertrophied thymus in the presence of this disorder without hyperthyroidism.[20] Therefore, there is a possible relation between the thymus and periodic paralysis.

Mamou reported obtaining relief of periodic paralysis by adrenal extract and irradiation of the thyroid, and, on the other hand, Hildebrand and Kepler produced attacks of periodic paralysis by administering adrenal cortical extract. The seizures of periodic paralysis can also be induced by administration of DOCAH in the patients with the disease.

Periodic paralysis may be the result of a polyglandular dysfunction, particularly a dysfunction of the thyroid gland, and in some cases with a hereditary background. As one key to explaining this abnormal myoneural mechanism, there are Grossman's case,[21] in which there was a functional lesion in the hypothalamic region, and the case reported by Sofue and others, in which there was dilatation of the hypophyseal groove in a roentgenogram of the skull.

SUMMARY

The author reports 3 cases of periodic paralysis associated with Graves' disease, adding those to a series of 11 patients who were admitted to the First Surgical Department of the Tokyo University School of Medicine from 1937 to 1952. These patients had no family history of periodic paralysis.

In the patient in Case 1, a woman, the attacks could be precipitated by intravenous injection of dextrose, by oral administration of fructose, and by hypodermic injection of epinephrine. During the pa-

ralysis, the value of serum potassium and the electrocardiographic observations were normal. In addition to goiter, a hypertrophied thymus was observed at operation. (Another case of goiter associated with hypertrophied thymus was observed among the series of 11 cases in the department.)

On the contrary, in Case 2, in which the patient was a man, a low level of serum potassium existed during the seizures, and flattening of the T waves in the electrocardiogram was observed simultaneously.

In Case 3, in which the patient was a woman, no pathologic evidence could be detected by various kinds of adrenocortical function tests, although no spontaneous attacks of paralysis occurred during the period of hospitalization. In all cases the attacks became more frequent and severe with increasing intensity of hyperthyroidism and disappeared completely after thyroidectomy.

Clinical data convinces the author that periodic paralysis may exist, in some instances, as a latent abnormality that easily becomes manifest as toxic function of the thyroid gland develops. There may be a similar relation between the thymus and paralysis in cases of this disorder, such as is seen with myasthenia gravis.

RÉSUMÉ

L'auteur reporte 3 cas de paralysie associée a la maladie de Basedowll ajoute ces cas à une serie de 11 malades qui furent admis au premier département chirurgical de l'école médicale de Tokyo pendant les années de 1937 a 1952. Ces malades n'avaient pas d'histoire de famille de paralyse périodique.

Dans le premier cas, il s'agissait d'une femme, on pouvait provoquer les attaques par l'injection intravéneuse de dextrose, par administration orale de fructose, ou par l'injection hypodermique de epinephrine. Pendant la paralysie le titre de potassium dans le sérum et les exame électrocardiographiques étaient normau A l'opération on trouva, à part du goitr un thymus hypertrophique. Un euxien cas de goitre, accompagné de thymus h pertrophique, fut observé au départeme dans la série des 11 cas.

Au contraire, au deuxième cas le tit de potassium dans le sérum etait plus b pendant les attaques, et en mème tem on observa à ce patient, un masculin, l'examen électrocardiographique l'aplati sement des ondes T.

Au troisième cas, une femme, aucu évidence pathologique fut découverte pe dant plusieurs examens fonctionaux de cortico- surrénale et aucune attaque par lytique eut li eu pendant la période d'o servation à l'hopital. Dans touts les ca les attaques étaient plus fréquentes et plu sévères pendant la croissance de l'hype thyroidisme et disparurent complèteme après la thyroidectomie.

Par des dates cliniques l'auteur est co vaincu, qu'une paralysie périodique peu exister quelque fois comme anomalie la tente, qui se manifeste facilement aussito qu'une fonction toxique de la gland thyroide se développe.

Peut être il ya une rélation entre thymus et la paralyse dans les cas de dérangement, qui ressemble à celui qu'o trouve dans la myasthénia gravis.

RIASSUNTO

L'autore riferisce 3 casi di paralisi pe riodica comparsa durante un morbo d Basedow; questi casi devono essere aggi unti a una serie di 11 malati ricoverat nel Io Reparto Chirurgico dell'Universit di Tokio dal 1937 al 1952.

Nel primo caso, una donna, l'attacc poteva essere determinato mediante un iniezione endovenosa di destrosio, o somministrando fruttosio per bocca o con un ipodermoclisi di epinefrina. Durante l'attacco i valori della [illegible] gl

elettrocardiogrammi rimanevano normali. All'intervento si trovò, oltre al gozzo, un timo ipertrofico. La stessa osservazione si fece in un altro malato della serie.

Nel secondo caso, per contro (un uomo) il livello del potassio ematico si abbassava durante le crisi e contemporaneamente compariva un appiattimente della T.

Nel terzo caso, infine, non si misero in evidenza manifestazioni patologiche durante i tests di funzione corticosurrenale, tuttavia durante il periodo di ricovero non si ebbero attacchi di paralisi.

In tutti i casi gli attacchi divenneri più frequqenti e più gravi con l'aggravarsi dell'ipertiroidismo e scomparvero completamente dopo tiroidectomia.

I dati clinici dimostrano che queste paralisi periodiche possono esistere in qualche caso allo stato latente e divenire manifeste in occasione di una disfunzione tiroidea.

ZUSAMMENFASSUNG

Der Verfasser berichtet über drei Fälle periodischer Lähmung in Verbindung mit Basedowscher Krankheit. Diese Kranken fügen sich einer Reihe von elf Fällen an, die in der Zeit von 1937 bis 1952 in die Erste Chirurgische Klinik der Universität Tokyo aufgenommen wurden. Die Familienanamnese enthielt nichts von periodischen Lähmungen.

Im ersten Falle handelte es sich um eine Frau. bei der die Anfälle durch intravenöse Einspritzung von Traubenzucker, durch orale Verabreichung von Fruchtzucker und durch subkutane Einspritzung von Adrenalin ausgelöst werden konnten. Der Kaliumspiegel im Blutserum und das Elektrokardiogramm waren während der Lähmung normal. Bei der Operation zeigte sich ausser dem Kropf ein hypertrophischer Thymus. (In der ersten Serie von elf Fällen kam ein weiterer Fall von Kropf und gleichzeitig bestehendem hypertrophischen Thymus zur Beobachtung).

Im Gegensatz zu dieser Kranken bestand bei dem zweiten Fall, einem Mann, während der Anfälle ein Absinken des Kaliumspiegels im Blutserum und gleichzeitig eine Abflachung der T-Zacken im Elektrokardiogramm.

Im dritten Fall, bei einer Frau, ergaben verschiedene Funktionsprüfungen der Nebennierenrinde keinerlei pathologische Befunde, obgleich während der Dauer des Krankenhausaufenthalts keine spontanen Lähmungsanfälle auftraten. In allen Fällen waren die Anfälle während des Anstiegs des Hyperthyreoidismus häufiger und schwerer und verschwanden völlig nach Resektion der Schilddrüse.

Auf Grund der klinischen Befunde ist der Verfasser überzeugt, dass die periodische *Lähmung in manchen Fällen als* eine latente Anomalie besteht, die, wenn sich eine toxische Schilddrüsenfunktion entwickelt, zum Ausbruch kommen kann. Vielleicht besteht eine ähnliche Beziehung zwischen der Thymusdrüse und Lähmungbei Züstänorn dieser Art die bei Myasthenia gravis beobachtet werden.

REFERENCES

1. (a) Dunlap, H. C., and Kepler, E. J.: Occurrence of Periodic Paralysis in the Course of Exophthalmic Goiter, Proc. Staff Meet. Mayo Clin. 6:272-275, 1931. (b) Hildebrand, A. G., and Kepler, E. G.: Familial Periodic Paralysis Associated with Exophthalmic Goiter, J. Nerv. & Ment. Dis. 94:713-721, 1941. (c) Kawaishi, K., and Kiriyawa, T.: Periodic Paralysis, J. Japan Surgical Society 36:2135-2140, 1935 (in Japanese). (d) Kepner, R. D.: Periodic Paralysis Associated with Hyperthyroidism; A Case Report, J. Neuropath. *& Clin. Neurol. 1:316-319, 1951. (e) Majima, E.:* Periodic Paralysis, J. Japan Surgical Soc. 44:1121, 1944 (in Japanese). (f) Millikan, C., and Haines, S. F.: Metabolic and Toxic Disease of the Nervous System, by Meritt, H. H., and Hare, C. C. Baltimore: The Williams & Wilkins Co., 1953, pp. 89-91. (g) Murachi, C.; Fujii, M., and Kaneko, G.: Periodic Paralysis, Jikken-Iho 1:517, 1913 (in Japanese). (h) Sofue, I.; Hayakawa, T., and Matsui, T.: Periodic Paralysis, Brain and Nerve (No-To-Shinkei) 5:45-51, 1953 (in Japanese). (i) Schoenthal, L.: Family Periodic Paralysis, Amer. J. Dis. Child. 48:799, 1934. (j) Zeigler, D. K.: Familial Periodic Paralysis: Report on Two Families with Observations on the Pathogenesis of the Syndrome, Arch. Int. Med. 81:419-430, 1949.

2. Talbott, J. H.: Periodic Paralysis, Medicine 20:85-143, 1941.

3. Herrington, M. S.: Successful Treatment of Two Cases of Familial Periodic Paralysis with Potassium Citrate, J.A.M.A. 108:1339, 1937.

4. Gass, H.; Cherkasky, M., and Savitoky, N.: Potassium and Periodic Paralysis: A Metabolic Study and Physiological Considerations, Medicine 27:105-137, 1948.

5. Oliver, C. P.; Ziegler, M. R., and McQuarrie, I: Hereditary Periodic Paralysis in a Family Showing Varied Manifestations, Am. J. Dis. Child. 68:308-311, 1944.

6. Tyler, E. H.; Stephens, F. E.; Ctunn, F. D., and Perkoff, G. I.: Studies in Disorders of Muscle: Clin[illegible]eritance of a Type of [illegible] Hypopotassemia, J. C[illegible]

7. Holtzapple, G. E.: Periodic Paralysis, J.A.M.A. 45:1224, 1905. Oppenheim, U., and Bernhardt, M,: Cited by Biemon and Sanders, J.: Family with Periodic Paralysis and Muscular Atrophy, J. Genetica 16:365-368, 1934. Stevens, Janice R.: Familial Periodic Paralysis, Myotonica, Progressive Amyotrophy, and Pes Cavus in Members of a Single Family, Arch. Neurol. & Psychiat. 72:726-741, 1954. Talbott.[2]

8. McArdle, B., and Allott, E. N.: Further Observations on Familial Periodic Paralysis, Clin. Science 3:229-239, 1937-1938.

9. Pudenz, R. H.; McIntosch, J. F., and McEachern, D.: Role of Potassium in Familial Periodic Paralysis, J. Clin. Invest. 17:530-531, 1938. The Role of Potassium in Familial Periodic Paralysis, J.A.M.A. 111:2253-2258, 1938.

10. Biemon, A., and Daniels, A. P.: Familial Periodic Paralysis and Its Transition into Spinal Muscular Atrophy, Brain 57:91-108, 1934.

11. (a) Ferrebee, J. W.; Atchley, D. W., and Loeb, R. F.: A Study of the Electrolyte Physiology in a Case of Familial Periodic Paralysis, J. Clin. Invest. 17:504-505, 1938. (b) Behavior of Electrolytes in Familial Periodic Paralysis, Arch. Neurol. & Psychiat. 44:830-840, 1940. (c) Gammon, G. D.; Austin, J. H.; Blitke, M. D., and Reid, C. G.: *The Relation of Potassium to Periodic* Family Paralysis, Am. J. M. Sc. 197:326-332, 1939. (d) Hammers, E. M. Jr.: Periodic Paralysis, J.A.M.A. 146:1401-1405, 1951. (e) Radennecker, J., and deHaeve, A.: Paralysie Periodique et Potassium Serique, Monatschr if. Psychiat. & Neurol. 111:113-143, 1945-1946. (f) Stephens, F. I.: Paralysis Due to Reduced Serum Potassium Concentration During Treatment of Diabetic Acidosis, Ann. Int. Med. 30:1272-1286, 1949. McArdle and Allott.[8] Pudenz and others.[9] Talbott.[2]

12. Aitken, R. S.; Allott, E. N.; Sastladen, L. I. M., and Walter, M.: Observation on a Case of Familial Periodic Paralysis, Clin. Science 3:229-239, 1937-1938.

13. Bendek, L., and Angyal, L.: Beitrage zur Pathogenese der Paroxysmale Lahneung, Ztschr. f. d. ges. Neurol. us. Psychiat. 174:213-228, 1942. Gass and others.[4] Talbott.[2]

14. Darowski, T. S.; [illegible] ler, A. W.: Exchanges [illegible] in Familial Periodic P[illegible] 65, 1948. Pudenz and others.[9] Talbott.[2]

15. Wolff, A.: The Effective Use of Thyroid in Periodic Paralysis, New York State J. Med. 43:1951-1953, 1943.

16. Kida, A.: Periodic Paralysis, J. Japan Internal Med. Soc. 11:138, 1923; 14:346-351, 1926 and 352-358, 1926; Nisshin-Igaku 16:121-176, 309-365, 507-576, 655-718, 1926 (in Japanese). Maclaire, A. S.: Case of Periodic Paralysis Associated with Thyroid Enlargement, J. Nerv. & Ment. Dis. 61:44, 1935. Morrison, S., and Levy, M.: The Thyroid Factor in Family Periodic Paralysis: Report of a Case, Arch. Neurol. & Psychiat. 28:386-393, 1932. Seed, L.: Periodic Paralysis in a Patient with Exophthalmic Goiter Controlled by 6-Propylthiouracil, West. J. Surg. 55:640-646, 1947. Stewart, H. J., Smith, J. J., and Milhorat, A. T.: Electrocardiographic and Serum Potassium Changes in Familial Periodic Paralysis, Am. J. Med. Sci. *199:789-794, 1940.* Dunlap and others.[1a] Kawaishi ard Kiriyawa.[1c] Majima.[1e] Wolff.[15] Schoenthal.[1i]

17. Fujita, S., and Hiro_e, N.: Periodic Paralysis, Annual Meeting of Japan Endocrinol. Soc., 1953, 1954 (in Japanese).

18. Singer, H. D., and Goodbody, F. W.: A Case of Familial Periodic Paralysis with a Critical Digest of the Literature, Brain 24:257-285, 1901. Holmes, J. M.: Familial Periodic Paralysis, Brit. Med. J. 1:80-82, 1941. Moersch, cited by Biemon and Daniels.[10] Laurent, C. P. E., and Walther, W. W.: Influence of Large Doses of Potassium Chloride on Myasthenia Gravis, Lancet 1:1434, 1935. Dunlap and Kepler.[1a] Talbott.[2]

19. Shinosaki, T.: Clinical Studies in Periodic Paralysis of Extremities, J. Japan Int. Med. Soc. 8:249-260. 1920: J. Tokyo Med. Soc. 35:207-252, 348-379, 1921; G. Fukuoka Medical School 15:691-789, 1922 (in Japanese); Klinische Studien uber die Periodische Extremitaeten lahmung, Ztsch. f. d. ges. Neurol. u. Psychiat. 100:564-611, 1926. Ferrebee and others.[11a]

20. Yoshida, T., and Kosuga, Y.: Periodic Paralysis, J. Okayama Igakukai 42:3033-3051, 1930 (in Japanese).

21. Grossman, C.: Periodic Paralysis Associated with Obesity of Hypothalmic Origin, Arch. Neurol. & Psychiat. 62:105-112, 1949.

ADDITIONAL SOURCES

Adie, W. G.: Tonic Pupils and Absent Tendon Reflexes, Brain 55:98-113, 1932.

Bernhardt, M.: Notizuber die familiare Form der Dystrophia Muscularis Progressiva u. deren Kombination mit Periodisch Auftretender Paroxysmaler Lahmung, Dtsch. Ztschr. Nervenheilk 8, 1896.

Cavare: Observation d'une Paralysis Generale due Sentiment et du Movement Affectant le Type Intermittent, Gaz. Med de Toulouse No. 38, 1853.

Dolinghaus, E. A.: Paroxysmal (Periodic) Paralysis in Two Brothers, Nervenarzt 14:347-352, 1941.

Hartwig, H.: Uber eiven Fall von Intermittierender Paralysis Spinalysis, Zen tralbl. f. d. Med. Wissensch 13:428, 1875.

Jsuji, K.: Periodic Paralysis, J. Japan. Endocrinol. Soc. 4:209-215, 1928 (in Japanese).

Johnson, J. W., Jr.: Family Periodic Paralysis: Report of Father and Son in World War I and II, M. Bull. Mediterranean Theat. Op. 3:16-19, 1945; War Med. 8:382-385, 1945.

Kadobaski, S.: Periodic Paralysis, Geka-No-Lyoiki 1:750, 1953 (in Japanese).

Mamon, H.: Periodic Paralysis of Lower Extremities in Man with Basedow's Disease, J. de Med. et Chir. Prat. 108:365-374, 1937.

Mankowsky, B. N.: Ueber die Paroxysmale Paralyse, Arch. Psychist. 87:280, 1929.

Milhorat, A. T.: Studies in Disease of Muscle, Arch. Neurol. & Psychiat. 39:354-372, 1938 ibid and 39:992-1024, 1937; J. Clin. Invest. 16:676, 1937.

Stoll, B., and Nisnewetz, S.: Electrocardiographic Studies in a Case of Periodic Paralysis, Arch. Int. Med. 67:755-761, 1941.

Watson, C. W.: Familial Periodic Paralysis: Reports of a Case Showing No Changes in Serum Potassium Level with a Description of Electroencephalographic Findings, Yale J. Biol. & Med. 19:127-135, 1946.

Yoshimura, K.: Periodic Paralysis, J. Japan Neurol. Society 42:3033-3051, 1930 (in Japanese). Ztschr. f. d. ges. exp. Med. 70:251, 1930.

To see a play performed by small children with a few footlights arranged on the floor in imitation of a theater is to feel that all that the saints have said about children is true. How exquisite are their voices, that are all music without the harshness of experience! To listen to them is like listening to the first birds. To see them is to be back in a world of apple trees in flower. There is comedy in the contrast between them and the grave parts they play and the grave speeches they utter as abbesses, poets, and harpers. But the very mimicry of our grown-up world, which begins by moving us, ends by filling us with bittersweet regret that the lives of men and women, after all, are not enacted in voices so sweet and by creatures so fair as these. The feeling may not be a deep one, and may be only for the moment; but, for the time at least, we wish with a pang that life could always have remained like this, that nobody would ever grow up or die, but that the very kings and admirals and prime ministers and thieves and shopkeepers were all children. It may be that, from the point of view of those who have passed into further aeons of existence, kings and admirals and prime ministers and thieves and shopkeepers are so. Who knows but that, in immortal eyes, a conqueror marching from ruined kingdom to ruined kingdom may be but a small boy with a toy sword at his side? After all, the gray-haired and the bald play their parts in almost as complete innocence of what they are doing as these children, who at least know that it is all a game.

—*Lynd*

Editorial

On Relaxation

HOW to find "time to relax" and what to do with it when one has found it are two questions vividly in the forefront of the modern mind. Newspaper columns teem with them; magazine articles by eminent authors, both professional and nonprofessional, insist upon them; loudspeakers broadcast them; book after book pours from the tireless presses on the same menacing theme: "Relax — or die!"

Men of "retiring age" are told that retiring does not necessarily mean going to seed, if only they will learn to relax; women past the menopause, whose occupation has left them with the departure of their children into maturity, are told that if they will only relax and adjust themselves, much happiness may still be theirs. Youngsters just out of high school, young men and women just out of college, have already been so indelibly impressed with the necessity of relaxation that one should not be surprised, perhaps, that many of them, on the theory that "if a little is good, more is better," are showing a tendency to choose total and permanent relaxation as the *summum bonum* of the good life. Only the other day I read the wry comment of a business executive who said: *"They don't apply for work, they apply for vacations. Before you have time to greet them civilly they burst out, 'What are your vacation arrangements?'"* That settled, he said, the elderly lines of strain and anxiety vanish from their smooth young brows and the employer can—if he's lucky—gently and tactfully draw their attention to the fact that there is work to be done. Many of them, he adds, betray no little surprise.

The propaganda for relaxation, therefore, is bearing its harvest, though not quite the sort of harvest the propagandists expected; for, to do them justice, they do not recommend permanent idleness as the *summum bonum.* On the contrary, they reprehend it equally with overwork and tension, and moreover suggest a remedy, the adoption of a "hobby" to engage one's leisure time. Given relaxation *and* a hobby, they say, the good life is within easy reach of all.

Well—perhaps. It is generally accepted as true that the human body and the human psyche have their limits of endurance even in health, but in the matter of work this proposition has seldom, if ever, been tested. It is unquestionably true that an avocation is an excellent thing. What the propagandists neglect to mention is the fact that an avocation arbitrarily adopted, with all the humorless solemnity that attends youth's first recognizance of the major experiences of birth, marriage and death, is hardly the sort of hobby to satisfy the soul.

Another important point they seem to have missed is the fact that relaxation cannot be distributed in envelopes labeled "vacation" or "leisure time." Those who enjoy a vacation and profit by it are those who already have interests, held in abeyance by work, to which they may abandon themselves for a stated time. Those who look forward to a vacation for [illegible] it takes them away from their work are likely to find themselves quite as discontented at leisure as they will be when leisure is over and they must turn their footsteps "back to the salt mines."

The mistake of the propagandists lies not in recommending relaxation but in failure to understand it; or, if they do understand it, to explain it adequately. Both leisure and relaxation—and surely this is an important lesson to teach the young—are matters of the mind and spirit. They have little to do with encircling a date on a calendar. The very choice of the word "vacation," as we Americans use it, is unfortunate, since it suggests an emptying rather than a replenishment. So is the choice of the word "hobby," which was originally a term of derision and still connotes child's play in the years of maturity; play for its own sake, that bears no fruit and is not expected to. The propagandists make no mention of the all-important fact that leisure and relaxation, like most other supremely good things, come best in small packages, and that both may be had *in the midst of work*. Which of them has told us that a moment of wonder at sight of a majestic sunset can do more to relax both mind and body than a month of idleness for its own sake? That a tender word or an encouraging glance from a friend or a loved one can pour peace like a river into a nerve-racking day? That a sudden, unexpected addition to one's knowledge or change in one's point of view can strike twenty years from one's essential age and bring back that breath-taking youthful awe and delight that one had supposed gone forever? That an avocation chosen by impulse, not by design, can lead to the discovery of a new talent and become a vital, growing element of life to which the mind can fly even when the body cannot? That even work itself, and routine work at that, contains moments of bone-deep satisfaction that a god might envy?

There are still some among us—call us mavericks if you like—who cannot relax to order unless those who impose the order also impose a straitjacket. Even if they do, I fear, the quality of relaxation obtained will be subject to doubt. There are some of us who cannot get a prescription filled for an avocation; our leisure moments are spent in trying to answer some insistent inner call that commands us to grow, to explore, to broaden our horizons and see to it that we miss no enrichment for which there is room in our lives. Finally, some of us, rightly or wrongly, regard work itself as no curse but the greatest of all the healing medicaments that Almighty God in his infinite mercy has given us to assuage the wounds of life.

To men and women of this eccentric breed a prearranged holiday is not only meaningless but painful. They will endure it for three days at most, and that only under duress or out of courtesy to others. They have no stomach for idleness while life pounds on the door, inviting, challenging and always with some new demand.

To this happy company I have belonged from birth. My "vacations" are filed under *Moments*, not under *Months*. I have therefore had a countless number of them, and I hope, God willing, to have many more. The accumulation of snapshots in my memory is prodigious, ranging the gamut of emotion from hilarity to tragic sorrow. I am willing to match them, exactly as they stand, with anyone's collection of snapshots taken on the Riviera, in the Alps, at Palm Springs or where you will. I have known the world's capitals of relaxation and enjoyed them, and I do not think it heresy to say that I have enjoyed them all the more because I have so often encountered them in the course of duty.

My life is also rich with avocations, but nobody chose them for me, and I did not even choose them myself; *they chose me*. To act on an impulse to try something unfamiliar and difficult, and to find it after all within one's capacity and a source of perpetual delight, is a wonderful experience. Why deny it to the young by leaving them in ignorance of its existence; or, worse, fill their receptive minds so full of the need for leisure time and relaxation that they cannot spare the attention to discover it themselves? Surely it is a strange, even a freakish obsession for the eager mind of youth to be preoccupied with relaxation, and a still stranger occupation for youth's resilient body to seek the barren fruits of idleness and expect to be nourished thereby. Let us teach our children, rather, that the good life is nearly always the reward of one who can quote with truth,

"But at my back I always hear
Time's winged chariot hurrying near . . ."

and who finds life all too short for the realization of half his dreams and desires. Let us grant them the need for relaxation and leisure, but let us show them where these blessings can best be found: in the midst of life, which is the midst of endeavor. Thus we shall spare them much boredom, which to the mind truly alive is life's only intolerable affliction. Thus we shall help them discover the secret of the good life's meaning, which is service and fulfillment, not divided into separate compartments but always inextricably intermingled. Why should we not teach them this? Is it not simple?

Too simple, perhaps, for the propagandists to consider.

—M. T.

◆

Speeches cannot be made long enough for the speakers, nor short enough for the hearers.

—*Perry*

Speech is a faculty given to man to conceal his thoughts.

—*Talleyrand*

Think all you speak, but speak not all you think. Thoughts are your own, your words are so no more.

—*Delany*

Wit is the salt of conversation, not the food.

—*Hazlitt*

The writer does the most who gives his readers the most knowledge, and takes from him the least time.

—*Sydney Smith*

It is with a word as with an arrow—once let it loose and it does not return.

—*Abd-el-Kader*

New Books

Books Received.—The following books have been received by the Editor; they will be reviewed critically as space and facilities permit. Omission of more extended review, however, is not to be taken as criticism of the merit of the book.

J.A.M.A. Clinical Abstracts of Diagnosis and Treatment. Selected by Noah J. Fabricant. New York and London: Grune, Stratton, Inc., 1955. Pp. 627 including index. Reviewed in this issue.

Cardiovascular Surgery. Henry Ford Hospital International Symposium. Edited by Conrad R. Lam. Philadelphia and London: The W. B. Saunders Company, 1955. Pp. 542.

Applied Medical Bibliography for Students. By William Dosite Postell. American Lecture Series No. 259. Springfield, Ill.: Charles C Thomas, Publisher, 1955. Pp. 142.

Ophthalmology. Edited by Paul C. Craig. Fort Pierce Beach, Florida: The Froben Press, 1955. Published as a memorial to the late Dr. Otis R. Wolfe.

Peripheral Nerve Injuries. Edited by H. J. Seddon. Medical Research Council Special Report, Series No. 282. London: Her Majesty's Stationery Office, 1954. Pp. 451, with 276 illustrations.

Textbook of Endocrinology. Edited by Robert H. Williams. Philadelphia: The W. B. Saunders Company, 1955. 2d ed. Pp. 776, with 173 illustrations. Reviewed in this issue.

Pathology. By Peter E. Herbut. Philadelphia: Lea & Febiger, 1955. Pp. 1227, with 1,378 illustrations in 661 plates, including 6 in color.

Surgery of the Small and Large Intestine. By Charles W. Mayo. Chicago: The Year Book Publishers, Inc., 1955. Pp. 340, with 94 illustrations.

Cancer Cells. By E. V. Cowdrey. Philadelphia and London: The W. B. Saunders Company, 1955. Pp. 667. Illustrated.

AMA Scientific Exhibits, 1955. American Medical Association. New York: Grune & Stratton, 1955. Pp. 784. Illustrated. Reviewed in this issue.

Sachs Essays. By Ernest Sachs. Hamden, Connecticut: The Shoe String Press, 1955. Pp. 118, with frontispiece (portrait of author).

Postural Back Pain. By Milton C. Cobey. Springfield, Ill.: Charles C Thomas, Publisher, 1955. Pp. 78. Illustrated. Reviewed in this issue.

Arthroplasty. By St. J. D. Buxton. Philadelphia: The J. B. Lippincott Company, 1955. Reviewed in this issue.

Physiotherapy in Some Surgical Conditions. By Joan E. Cash. Philadelphia and Montreal: The J. B. Lippincott Company, 1955. Pp. 350, with 26 illustrations on 24 plates.

The Blood-Brain Barrier, with Especial Regard to the Use of Radioactice Isotopes. By Louis Bakay. Springfield, Ill.: Charles C Thomas, Publisher, 1956. Pp. 154, with 32 illustrations.

Atlas of Plaster Cast Techniques. By E. E. Bleck. Chicago: The Year Book Publishers, 1955. Pp. 128, with 437 illustrations.

Peripheral Vascular Disease. By A. J. Barnett and J. R. Fraser. Melbourne, Australia: Melbourne University Press, 1955. Pp. 200. Illustrated.

Fibro-Osseous Proliferation. By George Stuart Hackett. Springfield, Ill.: Charles C Thomas, Publisher, 1955. Pp. 97, with 17 illustrations.

Man in a Cold Environment: Physiological and Pathological Effects of Exposure to Low Temperatures. By Alan C. Burton and Otto G. Edholm. Baltimore: The Williams and Wilkins Company, 1955. Pp. 273. Illustrated by graphs and charts.

Antimicrobial Therapy in Medical Practice. By Harrison F. Flippin and George M. Eisenberg. Philadelphia: F. A. Davis Co., 1955. Pp. 284.

BOOKS REVIEWED

Surgery of the Small and Large Intestine: A Handbook of Operative Surgery. By Charles W. Mayo, Chicago: The Year Book Publishers, Inc., 1955. Pp. 340, with 94 illustrations.

The four main sections of Dr. Mayo's Book deal successively with (1) diet, instruments and incisions; (2) the small intestine; (3) the colon, and (4) the rectum and anus. The text is concise, thorough, explicit and extremely well organized. From the opening exposition of blood supply, the lymphatics and anatomic relations through the sections on (a) benign, (b) inflammatory, (c) obstructive and (d) malignant lesions, the arrangement is logical and the presentation well worked out.

The plates are clearly reproduced and well integrated with the author's discussion of the parts involved. They have been set on the odd pages facing the appropriate text.

For many reasons, the book is excellent for surgeons, residents and medical students in general. It avoids the overuse of statistics, overemphasis of variation in procedure and controversial types of therapy, dealing strictly with surgical technic. This is a real thumbnail compendium on surgical treatment of the bowel from duodenum to rectum, and no doctor's library should be without a copy.

JEROME J. MOSES, M.D.

Physiotherapy in Some Surgical Conditions. By Joan E. Cash. Philadelphia and Montreal: The J. B. Lippincott Company, 1955. Pp. 350, with 26 illustrations on 24 plates.

The author writes this book from the School of Physiotherapy of the United Birmingham Hospitals, Birmingham, England.

It is a volume intended primarily for physiotherapists, but there are points in it that could be reviewed with profit by the general surgeon. The author stresses, in connection with thoracic and abdominal surgery, the value of the physiotherapist in teaching the patient how to breath, what postures to assume and how to institute early movement of the extremities.

In dealing with injuries of the extremities, the point is made that there may be developed a "loss of connection between brain and limb" and that this may be overcome b early encouragement of the patient to exe cise the extremity as much as possible, eve though it is immobilized in a cast. Of pa ticular value to this reviewer were the a thor's comments on what the physiotherapis may accomplish with Colles' fracture, fractures of the femoral neck in elderly patient and fractures of the spine. In connection wit lesions of the lower extremity, the problem o limping is well handled, with suggestions a to how this may be overcome. The role of th physiotherapist in rehabilitation of the amputee and in the care of the stump is also wel done. The author discusses the physiotherapist's role with regard to many common complications, e.g., edema of the arm followin radical mastectomy. Her comments are reasonably well balanced, and she gives attentio to the use of roentgen therapy for certain disorders, although this is not mentioned in connection with the treatment of bursitis.

Certain suggestions are open to question such as the removal of a slough in an infecte wound by *obtaining a "very severe reactio* with ultraviolet rays." The value of physiotherapy in the prevention of contractures an muscle atrophy following certain types o fractures and burns is well outlined.

Much of the text of this volume has to d with pathology and physiology, but these are described in terms comprehensible to the physiotherapist. The chapter on nerve function and regeneration and on muscle paralysis could have been much more comprehensive for the information of the student of physiotherapy. Some of the newer developments in the armamentarium of the physiotherapist such as ultra sound wave therapy, are not mentioned. One of the major defects of this volume is its lack of adequate descriptions of the various types of apparatus used by the physiotherapist in his daily work. Perhaps the author has intentionally omitted a discussion of apparatus, believing that the student can find discussions of this in other textbooks. In her preface she states that "the object of this book is to try to show that physiotherapy is of value in some of the diseases and injuries treated by the surgeon." To this extent she has accomplished her purpose.

C. C. GUY, M.D.

Textbook of Endocrinology. Edited by Robert H. Williams. Philadelphia: The W. B. Saunders Company, 1955. 2d ed. Pp. 776, with 173 illustrations.

In preparing the new edition of this comprehensive text Dr. Williams, who is Executive Officer and Professor of Medicine at Washington State University in Seattle, has enlisted the aid of ten prominent contributors, integrating their presentations into a unified whole. The first three chapters, which deal successively with general endocrinologic principles, the pituitary gland and the thyroid gland, were written by the editor himself. Dr. Peter H. Forsham of the School of Medicine of the University of California and Dr. George W. Thorn, Hersey Professor of the Theory and Practice of Physic at Harvard, have contributed essays on the adrenal glands and on the pancreas and diabetes mellitus. The section on the testes has been written by Dr. John Eager Howard, Associate Professor of Medicine at Johns Hopkins, and Dr. William Wallace Scott, Professor of Urology at the same institution. The ovaries are discussed by Dr. George V. Smith, William H. Baker Professor of Gynecology at Harvard; the parathyroid glands, by Dr. Edward C. Reifenstein Jr., Clinical Professor of Medicine at New York Medical College; the influence of the endocrine glands on growth and development, by Dr. Lawson Wilkins, Associate Professor of Pediatrics at Johns Hopkins; the general subject of neuroendocrinology, by Dr. Harry B. Friedgood, Physician-in-Chief and Medical Director of the Diagnostic Clinic of The Willys Unit in Toledo, Ohio, and the problem of obesity by Dr. William H. Daughaday, Assistant Professor of Medicine at Washington University, St. Louis, Missouri. The two concluding sections, one of which deals with laboratory diagnostic and assay procedures and the other with the diagnosis and treatment of endocrinopathic conditions and the hormone preparations, are the work of the Editor, Dr. Williams.

The illustrations, all of which are apt and well reproduced, consist of graphs, charts and photographs, including an admirable page-size color plate showing the salient features of Cushing's disease. Many tables are included, and there is an index of 33 pages.

In his preface to this edition, the second, Dr. Williams points out that much of it has been entirely rewritten and all of it thoroughly revised and brought up to date, "in order to incorporate the numerous recent advances in a clear and concise manner." For this purpose he has included discussions of the newest hormone preparations and placed much emphasis on diagnosis, since "a common problem is the determination of which patients have endocrine disorders and which do not."

The reviewer not only agrees with Dr. Williams as to the necessity of constant revision in one of the newer fields of therapy but considers the result of the effort, in this instance, remarkably good. *Textbook of Endocrinology* in its initial edition was well received; it is altogether probable that this well conceived and well executed second edition will find even more favor among endocrinologists, specialists in allied fields and the profession in general. As a textbook for medical schools it should be extremely valuable, since the writing throughout is lucid, readable and not overloaded with unnecessary technical terms.

M. T.

Postural Back Pain. By Milton C. Cobey. Springfield, Ill.: Charles C Thomas, Publisher, 1955. Pp. 78. Illustrated.

Dr. Milton C. Cobey is Professor of Orthopaedic Surgery at Georgetown University Medical School, Washington, D. C. Since the days when he was an orthopedic trainee under the direction of Dr. George E. Bennett and Mr. H. O. Kendall of the Johns Hopkins University in Baltimore, Dr. Cobey has been interested in the effect of bad posture upon pain in the back.

This little book is a monograph 78 pages long and is well illustrated with drawings and roentgenograms. As the author has clearly stated, pain low in the back due to incorrect posture is much more common than is generally recognized. Backaches primarily caused by injury or disease may be made infinitely more disabling as a result of chronic habitual errors in posture. Every physician should be interested in preventive medicine, and this monograph will provide anyone who studies it with information that will be helpful to him and to his patients in the prevention or amelioration of "low back pain."

EDWARD L. COMPERE, M.D.

J.A.M.A. Clinical Abstracts of Diagnosis and Treatment, 1955. Selected by Noah D. Fabricant. New York and London: International Medical Book Corporation (with Grune & Stratton, Inc.), 1955. Pp. 627.

This volume is the first of the annual series to be published by the *Journal of the American Medical Association.* It consists of abstracts selected by Dr. Noah D. Fabricant, Editorial Associate of that indispensable weekly, from those which have appeared in the *Journal's* pages during 1955.

As Dr. Fabricant truly states in his preface, "the world literature has become so voluminous that no physician can hope to find time to read all of it. . . . Obviously, adequately prepared abstracts cannot be regarded as substitutes for original articles, but they should be able to furnish physicians with sufficient details to determine whether the original is worth reading in full." He adds, of the abstracts appearing weekly in the *Journal,* that they are selected from more than 1,200 medical periodicals throughout the world. Those selected from the 1955 output were chosen on the basis of the two most important aspects of medical science—diagnosis and treatment.

The abstracts, then, cover these two important subjects in fourteen classified fields: internal medicine, surgery, neurology and psychiatry, pediatrics, gynecology and obstetrics, dermatology, urology, ophthalmology, otolaryngology, therapeutics, pathology, radiology, anesthesia and physiology. Each section is separately indexed for the reader's convenience.

In addition to supplying the criteria referred to by Dr. Fabricant, the yearly publication of such a volume by the *Journal of the American Medical Association* is a valuable contribution of the source material available to the medical investigator and writer. In compiling his bibliographic references he should find it immensely helpful in selecting those most apposite to his need.

In short, the value of such a series can be incalculable.

M. T.

A.M.A. Scientific Exhibits, 1955. New York: Grune & Stratton, Inc., 1955. Pp. 784. Illustrated throughout.

By its intrinsic nature this large volume consists principally of illustrations, though explanatory text is included wherever necessary or desirable. The book's content is an exposition of the scientific exhibits presented at the annual meeting of the American Medical Association. It has been said of these annual exhibits that they "offer the finest postgraduate medical course in the world."

Thomas G. Hull, Secretary of the A.M.A. Council on Scientific Assembly, points out in his preface that the enthusiasm aroused by the original exhibits more than justifies their presentation in book form, so that "physicians unable to attend the annual meeting ... are enabled to read and study the exhibits without hurry and at their own convenience." In a word, the volume presents a great number of highlights in scientific progress that no physician or surgeon would willingly miss seeing. We congratulate the A.M.A. on this further contribution to scientific progress.

M. T.

Arthroplasty. By St. J. D. Buxton. Philadelphia: The J. B. Lippincott Company, 1955.

This monograph of 126 pages includes a brief historical review of the literature on arthroplasty and mentions the various joints for which arthroplasty has, at some time, been recommended and performed. Most of the book is occupied with discussions of arthroplasty of the hip, with emphasis upon the arthroplasty in which some type of prosthesis is used. Perhaps the most significant and valuable part of the monograph is Chapter 6, which deals with complications and difficulties of the Judet arthroplasty.

Mr. Buxton is Consulting Orthopaedic Surgeon to King's College Hospital and Emeritus Lecturer in Orthopaedics to King's College Medical School. He is Past President of the British Orthopaedic Association and was formerly Hunterian Professor of the Royal College of Surgeons. He is also Consulting Orthopaedic Surgeon to the Army and Orthopaedic Surgeon to Queen Mary's Hospital at Roehampton and to the Royal Masonic Hospital, London. He has had a wide and varied experience in orthopedic surgery, with a special interest in the subject presented in this book. Any surgeon who is especially interested in the arthroplastic operative technics, will wish to have this monograph in his library.

EDWARD L. COMPERE, M.D.

Abstracts from Current Literature

Radioactive Iodine or Surgery in Treatment of Hyperthyroidism. Clark, D. E., and Rule, J. H., J.A.M.A. 159:995, 1955.

During the past eight years the authors have treated 700 patients with primary or secondary hyperthyroidism in the University of Chicago Clinics. This large experience has helped them to establish fairly definite and generally accepted criteria for the therapeutic application of I^{131}.

Although thus far there have been no reports of adverse effects from irradiation, the fear of inducing carcinoma of the thyroid in young patients with uncomplicated thyrotoxicosis has deterred them from using I^{131} in the treatment of patients under 40. Since the amount of radiation required to induce a carcinoma is not known, Clark and Rule are even unwilling to give children tracer doses of I^{131} for functional studies of the thyroid.

Because they have never seen a carcinoma in a patient with toxic adenomatous goiter, they have not hesitated to treat such patients, if they are over 40, with I^{131} if the goiter is small or moderate sized. Older patients with large toxic adenomas are better treated surgically, since the pressure symptoms may not be relieved by I^{131} even though the thyrotoxicosis is controlled.

Patients with recurrent or persistent hyperthyroidism are preferably treated with I^{131}. The risk of recurrent nerve injury and/or parathyroid removal is considerable in this group. I^{131} is also the treatment of choice when the surgical risk is excessive because of such complications as organic heart disease, renal, pulmonary or mental disease, diabetes, hypertension and severe rheumatoid arthritis.

A small group of patients with intolerance of iodine or antithyroid drugs could not be properly prepared for operation and were treated with I^{131}, with excellent results.

Exophthalmos of varying degree was present in 189 patients who are treated with I^{131}. Although an increase in exophthalmos was observed in only 1 patient after this therapy, the authors were unwilling to go beyond the statement that it was their impression that improvement of exophthalmos with I^{131} therapy is somewhat better than with surgical intervention.

In their opinion the coexistence of hyperthyroidism and pregnancy is an absolute contraindication for I^{131} therapy, because it has been shown that I^{131} readily crosses the placental barrier, and the fetal thyroid is able to concentrate iodine after the third month. I^{131} has also been encountered in the milk of lactating women.

Additional contraindications to radioactive iodine therapy are the clinically solitary nodule associated with hyperthyroidism, nontoxic nodular goiter and nontoxic diffuse or simple goiter. With or without I^{131} therapy, the solitary nodule should be surgically treated unless the presence of carcinoma can be otherwise excluded.

The results of treatment in this large series were excellent. I^{131} therapy carried no mortality, no parathyroid destruction and no recurrent nerve damage. Its cost is relatively low as compared with that of operation. Hospitalization and work loss are not entailed. Additionally, the recurrence rate is negligible.

Once the fear of carcinogenesis has been dispelled, the administration of I^{131} should also become the treatment of choice for young persons with uncomplicated hyperthyroidism.

THOMAS WILENSKY, M.D.

Causes and Treatment of Abdominal Adhesions. Myburgh, A. L., Arch. Chir. Neerlandicum 6:112, 1955.

Hyaluronidase prepared from bovine testis was found to conform to therapeutic requirements; this was proved experimentally in rabbits, in which mechanical trauma, chiefly, was used. The following observations were made:

1. Talcum powder (as used for surgical gloves) produced adhesions in 15 animals in two groups of experiments. In 5 animals 100 mg. was used, and in 10 animals 10 mg. caused adhesions.
2. Tincture of iodine caused massive adhesions, peritonitis or obstruction in 5 animals when applied to an intestinal loop. They all died within five days.

3. Sepsis introduced into the peritoneal cavity produced massive adhesions in six animals.

4. Mechanical trauma of the serosa and the tissue underlying this membrane caused adhesions in 90 per cent of animals.

5. Inserting a hard drainage tube produced adhesions in 3 of 15 animals (20 per cent), but if the peritoneal end of the tube was split into four before insertion, no adhesions formed in the 10 animals tested.

In the study of adhesion prevention, amniotic fluid, pepsin and trypsin, papaine, streptokinase and streptodornase, heparin and cortisone have all been employed and found disappointing. The author cites the work of Thomas, Chandy and others (1950), who observed that adhesions developed in 76 per cent of traumatized animals treated with hyaluronidase and in 89 per cent of controls. Connolly and Richards (1951) made further experiments and noted that when this enzyme was added to talc as a traumatizing agent, no adhesions formed in dogs. Two thousand units were necessary, and there was no delay in healing of the anastomoses. Fourteen clinical subjects were treated, with use of 6,000 units dissolved in 20 ml. of isotonic saline solution. In 12 cases no symptoms were observed afterward, and in 2 cases obstruction developed seven and thirty days, respectively, after operation. The failures were attributed to insufficient dosage, and the authors suggested 10,000 to 12,000 units. In the present author's opinion talc is unreliable in forming experimental adhesions, and he suggests scraping or clamping the serosa, introducing infection or inserting a thick, hard drainage tube. Hyaluronidase is effective for twenty-four hours only, yet the fibroblast makes its appearance from the third to the fifth day after injury and remains until fibrous tissue has replaced the fibrin. The effect, therefore, is likely to be found in (a) rapid adsorption of exudate, (b) enzyme action in dissolving fibrin, or (c) suppression of the fibroblast, probably in the manner suggested by Connolly and Richards.

Hyaluronidase should not be used in cases of peritonitis, because of the spread of infection. The results of the author's experiments were as follows: In 12 animals mechanically traumatized, six hyaluronidase treatments (2,000 units of hyalase, Benger, at twenty-four hour intervals) resulted in 100 per cent intestinal prevention. A single thin adhesion to the abdominal scar was noted in 1 of the 12 animals. Of the control animals, adhesions formed in 90 per cent of those mechanically traumatized; of talc-traumatized animals, adhesions formed in 100 per cent. The author states that adhesions should not be treated prophylactically. In an aseptic abdominal operation nothing should be inserted into the peritoneal cavity to prevent the formations, unless extensive areas of denuded serosa remain at the end of the operation. If underlying tissue is injured over considerable areas, prophylactic treatment should be seriously considered, as adhesions will form in 90 per cent of cases. The true indications for hyaluronidase treatment are presented (1) in all laparotomies in which many adhesions are observed and adhesions are loosened; (2) in cases in which operation or repeated operation is required on account of adhesions and in which no hyaluronidase treatment has been given, e.g., cases of obstruction, and (3) in cases in which denuded areas are observed and the patient can be classified under "fibroblastic diathesis."

Any antibiotic may be mixed with hyaluronidase and should be used when infection has been present but controlled by antibiotic treatment, with maintenance of normal temperature and no visible septic exudation or pus. The author describes two technics for the use of hyaluronidase. In the first, hyaluronidase, 8,000 units, added to 150 ml. of isotonic saline solution in a small vacolitre, is heated in a basin of warm water up to 40 C. as checked by a water thermometer. Procaine hydrochloride, 5 ml., is injected into a site near the umbilicus, and the abdominal wall is elevated by traction on wound sutures. A short, beveled, fairly thick needle is inserted through the anesthetized area, and injection is made continuously while the needle is inserted through the peritoneum, for the purpose of blowing the intestine away from the parietal peritoneum. Danger is involved when meteorism or gross distention is present. Only 1 patient has been treated by this method. By the second method, a small, soft catheter or rubber tube is stitched into the peritoneum when the wound is closed and held in position by a skin stitch. The part that enters the peritoneal cavity is split into four parts, which gives it a fimbriated, movable and soft effect. The outer end is closed off with a skin clip, so that the injections that must follow can be made directly through the tube. At the time of operation the hyaluronidase solution is poured directly on to traumatized areas.

WARREN A. YEMM, M.D.

Gastric Ulcer: A Review of 150 Male Patients. Regan, M. D., Southern M. J. 48:870, 1955.

This is a study of 150 gastric lesions observed at the McGuire Veterans Administration Hospital in Richmond, Virginia, between 1947 and 1954.

One hundred and forty lesions were benign (5 per cent of the patients had more than one ulcer simultaneously). Of these, 20, or 14 per cent, required rehospitalization once or more because of recurrence. Ten, or 6.7 per cent, of patients originally considered to have simple gastric ulcers, actually had carcinoma.

Diagnosis was made usually by roentgen ray. Gastroscopy, however, was helpful or diagnostic more than a fourth of the time. In 8 cases the ulcer was seen gastroscopically after failure to visualize it by roentgen ray.

Operation in 4 cases disproved the roentgen and gastroscopic diagnosis of malignancy. In 5 cases of benign ulcer, histamine achlorhydria was present. In 5 cases of carcinoma 13 to 50 degrees of acid was observed after histamine was administered.

Acute perforations with massive hemorrhage caused 17 patients to be operated on immediately. One-fourth of those with benign ulcers were eventually operated on because of failure to heal, recurrence, hemorrhage, obstruction or possible malignant change. Associated disease of the duodenal bulb was present in 23.5 per cent of cases.

The 10 instances of ulcerated carcinoma all presented difficulties in diagnosis. The ulcers were located preponderantly in the body of the stomach and the prepyloric region, much as were the benign lesions. After the initial roentgen studies, in only 3 of the 10 was malignant disease definitely suspected. Seven patients were subjected to gastroscopic study, and 4 lesions were visualized. Only 2 of these 4 ulcers were thought to be carcinoma at the original examination.

Most of the patients have either died or shown metastases. One is living after five years.

WILLIAM E. NORTH, M.D.

Indications for Surgery of the Adrenal Gland. Alvarez Ierena, J. de J., Mexican J. Urol. 2:181, 1955.

The author's indications for unilateral extirpation of the gland are as follows:

1. Cushing's syndrome, infantile virilism, pseudohermaphrodism or the adrenal-genital syndrome
2. Feminizing cortical tumors
3. Pheochromocytoma
4. Cancer of the breast or of the prostate (for palliation).

Bilateral segmentary resection is indicated (1) as a complementary step of the previous operation when the adenomas and hyperplasia are bilateral and the surgeon does not wish to make the patient dependent upon cortisone, and (2) when the extirpation of one gland has not relieved the patient of his symptoms, particularly true if the 17-ketosteroids have remained high after the primary intervention.

In the hands of Huggins of Chicago and Cox of England, bilateral extirpation has produced excellent palliative results in cases of hopeless cancer of the breast and prostate. It is also indicated for (1) malignant hypertension; (2) dementia associated with hyperadrenalism; (3) rheumatoid arthritis that has not responded to hormone therapy, and (4) periarteritis nodosa.

The author has spent some time in Chicago with Dr. Huggins. As a result of the enthusiasm he has shown in this field, this reviewer fears that most surgeons would be inclined to take issue with him as to some of his indications, which would appear extremely radical to them. He has covered a tremendous amount of territory in his original article, and one can only commend him "for goal."

MARK NETTLES, M.D.

To find fault is easy; to do better may be difficult.

—*Plutarch*

FOUNDED BY DR. MAX THOREK

The Journal of the International College of Surgeons

Official monthly publication of the International College of Surgeons

Editor-in-Chief
MAX THOREK, M.D., Sc.D., LL.D., F.B.C.S., F.I.C.S., F.P.C.S. (Hon.), F.R.S.M.

Associate Editor
PHILIP THOREK, M.D., F.A.C.S., F.I.C.S.

Consulting Editor
MORRIS FISHBEIN, M.D., F.I.C.S. (Hon.)

Assistant Editors
DOROTHY LANGLEY AND PAULA GOLICK

Specialty Editors

Cardiovascular Surgery
Bert Hollis Cotton, M.D., F.I.C.S., D.A.B.
Los Angeles, California

Genitourinary Surgery
Michael K. O'Heeron, M.D., F.A.C.S., F.I.C.S
Houston, Texas

Neurologic Surgery
James W. Watts, M.D., F.A.C.S., F.I.C.S.
Washington, D. C.

Obstetric and Gynecologic Surgery
J. P. Greenhill, M.D., F.A.C.S., F.I.C.S.
Chicago, Illinois

Occupational Surgery
Chester C. Guy, M.D., F.A.C.S., F.I.C.S.
Chicago, Illinois

Ophthalmologic Surgery
Paul C. Craig, M.D., F.A.C.S., F.I.C.S.
Reading, Pennsylvania

Orthopedic Surgery
Edward L. Compere, M.D., F.A.C.S., F.I.C.S.
Chicago, Illinois

Otolaryngologic Surgery
Francis L. Lederer, M.D., F.A.C.S., F.I.C.S.
Chicago, Illinois

Plastic and Reconstructive Surgery
Neal Owens, M.D., F.A.C.S., F.I.C.S.
New Orleans, Louisiana

Proctologic Surgery
Harry E. Bacon, M.D., F.A.C.S., F.I.C.S.
Philadelphia, Pennsylvania

Surgery of Thyroid, Parathyroids and Thymus
Arnold S. Jackson, M.D., F.A.C.S., F.I.C.S.
Madison, Wisconsin

Thoracic Surgery
Thomas J. Kinsella, F.A.C.S., F.I.C.S.
Minneapolis, Minnesota

Allied Sciences
Dr. Paul Bernard Szanto, F.A.C.P., F.I.C.S., Chicago, Illinois

Official Journal of the International College of Surgeons, Published Monthly
PUBLICATION OFFICE: 1516 Lake Shore Drive, Chicago 10, Ill.
Entered as second class matter at the post office at Chicago, Ill. under the act of March 3, 1879
Yearly Subscription: Domestic and Foreign, $12.00
Copyright 1956, by the International College of Surgeons

The Journal of the International College of Surgeons

Official monthly publication of the International College of Surgeons

CONTENTS

VOLUME XXV, NUMBER 4
APRIL, 1956

ABDOMINAL AND GENERAL SURGERY

Duplication of the Alimentary Tract: Report of a Case 403
Virgilio Alves de Carvalho Pinto, M.D., F.I.C.S., Sao Paulo, Brazil

Total Gastrectomy: An Evaluation 409
E. S. Brintnall, M.D., F.A.C.S., D.A.B., Kate Daum, Ph.D., R. C. Hickey, M.D., F.A.C.S., R. T. Tidrick, M.D., F.A.C.S., and A. P. Wickstrom, M.D., Iowa City, Iowa

A Review of Two Hundred Gastrectomies 421
Gerald B. Reams, M.D., Captain U.S.A.F. (MC), Miami, Florida

Cystic Dilatation of the Common Duct: Review of the Literature and Report of a Case 430
Edgard Barbosa, M.D., and Robert G. Rate, M.D., F.A.C.S., F.I.C.S., D.A.B., Halstead, Kansas

The Encysted Gallstone: Technic for Cholecystectomy 442
Thomas C. Case, M.D., F.A.C.S., F.I.C.S., New York City, New York

Fatal Massive Gastrointestinal Hemorrhage Due to Multiple Phlebectasia of the Small Intestine 445
S. L. Shandalow, M.D., F.I.C.S., Brooklyn, New York

CARDIOVASCULAR SURGERY

Experimental Methods of Arterialization of the Liver: The Aortosplenic Anastomosis 448
Manfredi Servello, M.D., and Renato Petronio, M.D., Padua, Italy

The "Middle Colic Artery": Its Position, Its Name and Its Surgical Dangers...... 455
Harry J. Fournier, M.D., F.I.C.S., Chicago, Illinois

GENITOURINARY SURGERY

Adenocarcinoma of the Urinary Bladder 461
John I. Williams, M.D., Fort Lauderdale, Florida; M. C. Godwin, M.D., Hines, Illinois, and Roland R. Cross, Sr., M.D., Chicago, Illinois

Radical Perineal Prostatectomy in the Treatment of Prostatic Carcinoma.......... 471
H. Haynes Baird, M.D., F.A.C.S., F.I.C.S., Charlotte, North Carolina

NEUROLOGIC SURGERY

Relief of Pain by Transorbital Electrocoagulation of the Frontal Lobes............ 475
E. E. Herzberger, M.D., F.I.C.S., and J. Braham, M.S., M.D., M.R.C.P., Tel Hashomer, Israel

The Use of Reserpine in Neurologic Surgery 480
Samuel Rosner, M.D., F.I.C.S., Bronx, New York

FOUNDED BY DR. MAX THOREK

The Journal of the
International College of Surgeons

FOUNDED IN GENEVA, SWITZERLAND, 1935 - INCORPORATED IN WASHINGTON, D. C., 1940

Vol. XXV APRIL, 1956 No. 4

Abdominal and General Surgery

Duplication of the Alimentary Tract

Report of a Case

V. CARVALHO PINTO, M.D., F.A.C.S., F.I.C.S., F.A.A.P.,
R. VILHENA MORAES, M.D., AND W. H. CARDIM, M.D., F.A.A.P.
SAO PAULO, BRAZIL

DUPLICATIONS of the alimentary tract have been rather infrequently reported; Gross[1] has so far presented the largest series of cases, while other writers have presented either small series or single cases.

Duplications of the alimentary tract are, according to Gross,[1] spherical or tubular structures that may appear at any level of the tract, to which they are usually closely attached. They possess a smooth muscle layer and a serous coat. This definition and denomination cover a series of cases described under wider terminologic limits (enterogenous cyst, enteric cyst, inclusion cyst, enterocystoma, ileum duplex, giant diverticulum, thoracic cyst of enteric origin, bronchogenic cyst, etc.), now assembled in one embryonically associated group.

A case of duplication of the ileum will be presented in this paper.

Embryologic Background.—The origin of duplication of the alimentary tract has been differently explained by several authors. According to Hughes-Jones,[2] during fetal life there occurs a sequestration of embryonal intestinal epithelium, which

---

From the Departamento of Tecnica Cirurgica e Cirurgia Experimental da Faculdade de Medicina da Universidade de Sao Paulo, Brasil.

Submitted for publication Jan. 5, 1956.

(Ripstein,[9] Johnston and others,[10] Black and Benjamin,[11] Donovan and Santulli[7]). This is due to its acid secretion, which contains enzymes and free hydrochloric acid.

Symptoms. — Although the duplication may exist without producing symptoms for many years, in the majority of cases it brings forth clinical manifestations during infancy and childhood.

The main symptoms presented are pain, gastrointestinal hemorrhage or symptoms due to partial or total intestinal obstruction.

The pain may be intermittent or continuous and sharp. The intermittent pain has been differently explained; Dohn and Povlsen[8] contended that it is due to spontaneously reduced intussusception or to alterations of pressure within the cavity of the duplication, a result of the variation of its secretion or of the motility of its walls. In the opinion of Gross, Holcomb and Farber,[12] the pain is the result of overdistention of the duplication or of inflammatory reaction of the neighboring viscera, in the cases in which the secretion of the duplications contains proteolytic enzymes and hydrochloric acid. Obviously, the pain may be a consequence of intussusception or volvulus, the duplication forming the leading point.

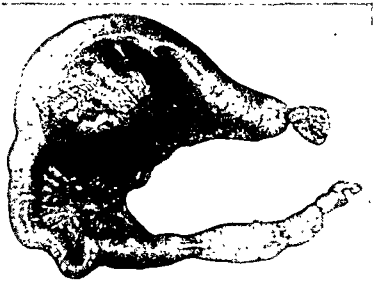


Fig. 1.—Resected specimen showing intramesenteric position of duplication and its close relation to vessels running to normal intestine.

Gastrointestinal hemorrhage, mild or severe, is due to ulceration of the adjacent bowel by the acid secretion of the gastric mucous membrane of the duplication or to the pressure of the latter on the blood vessels along the mesentery, with consequent interference in the blood supply of the bowel.

Partial or total intestinal obstruction may be the result of intussusception or

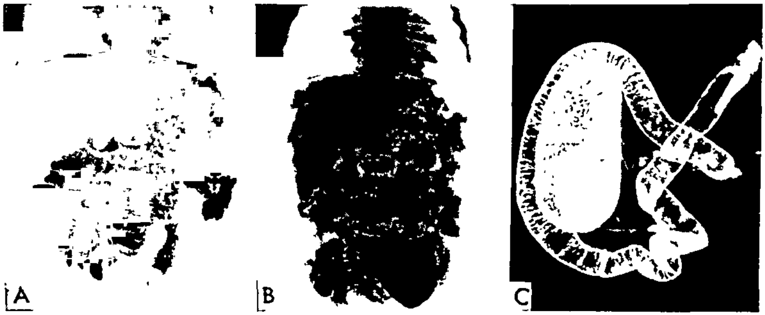


Fig. 2.—*A* and *B*, different positions of pouch in two successive plates. *C*, roentgenogram of resected specimen after introduction of barium, showing relation between normal loop and duplication.

volvulus or may be due to encroachment on the adjacent bowel.

Physical examination may reveal the signs of intestinal obstruction or a palpable intraabdominal tumor, if this is present. On the other hand, it may reveal no abnormality whatever.

The roentgenographic studies are not, as a rule, characteristic. Should there be obstruction, its roentgenographic signs are seen, but the duplication itself is rarely demonstrated. Nevertheless, two features may be eventually observed, namely, the displacement of the normal bowel by an abnormally situated air-containing viscus (Donovan and Santulli[7]) and the filling of the duplication by contrast medium. This latter is rare, having been but once reported (by Gross[1]). It was this observation that led us to the diagnosis of intestinal duplication in our case (Fig. 2, *A* and *B*).

normal bowel, the conjoint resection of the duplication and the normal bowel is preferable. Except with poor risks, the latter procedure should always be carried out. Duplication of the duodenum should be treated according to Gardner and Hart,[15] who advised the creation of a window between the duplication and the adjacent bowel.

REPORT OF CASE

A. C., a 1-year-old white boy weighing 8.4 Kg. was admitted to the hospital with a history of abdominal distention, constipation and vomiting of two days' duration. Since early infancy the baby had not enjoyed good health; there had been intermittent periods of constipation and diarrhea. Ten days before admission the constipation became more marked and the baby grew restless, crying most of the time. During the two days prior to admission he began to vomit and the abdomen became distended. No blood in the stools was reported.

Examination on admission revealed the

Pathologic Picture.—The specimen consisted of a rounded cystic mass, measuring 10 by 7 by 6 cm. (Fig. 1), situated on the mesenteric side of the normal bowel and within the mesentery. The two structures shared a common wall, which showed an opening at its distal end, by means of which the duplication communicated with the adjacent intestine.

Microscopically gastric mucosa was seen lining the duplicate bowel. No ulcers were observed. Figure 2*C* reproduces a roentgen plate taken after introduction of barium into the duplication.

COMMENT

Duplication of the alimentary tract, a most interesting developmental anomaly, has in the late years been specially studied by the surgeons who do pediatric work, and the literature shows a growing number of cases reported.

Although the embryonic origin of the anomaly is still under discussion, it is generally agreed that several structures closely attached to the alimentary tract should be grouped together under one denomination "duplication," because they share common characteristics; namely (Gross[1]), they show a microscopic structure similar to that of the normal bowel (with a mucous membrane, a muscle layer and a serous coat) ; a mucosal lining similar to that of any part of the alimentary tract, and a common wall between the structure and the bowel.

The presence of this anomaly, so closely attached to the bowel, may bring forth clinical manifestations that may suggest its diagnosis. Intermittent abdominal pain, intestinal hemorrhage or partial or total obstruction may lead the observer to suspect this diagnostic possibility. In such cases, when operation is contemplated, the preoperative treatment should be directed toward intestinal resection.

In the case here reported the symptoms were those of partial intestinal obstruction; although no blood was ever noticed in the stools it was observed that gastric mucosa lined the duplication.

The preoperative diagnosis of intestinal duplication is rarely made. Roentgen studies are not usually characteristic; nevertheless, in our opinion, roentgenolographic studies should be carried out in such cases, for as in some of them the normal intestine may communicate with the duplication, the latter may become filled with barium, as happened in our case.

SUMMARY

The authors present a case of intestinal duplication involving the ileum in a 1-year-old white boy. The symptoms were those of partial obstruction, and microscopic examination revealed the duplication to be lined with gastric mucosa; no ulcers were present. The duplication was resected, together with the adjacent bowel. The operation was successful.

RÉSUMÉ

Un cas de duplication intestinale est reporté concernant l'ileum chez un garçon, agé d'une année. Les symptômes étaient ceux d'une occlusion partiale, et l'examen microscopique révéla, que l'intestin double était couvert de membrane muqueusse gastrique . Il n'y avait pas d'ulcères. La résection de l'intestin double et des segments joignants fut exécutée avec succès.

ZUSAMMENFASSUNG

Es wird über einen Fall von Verdopplung des Ileums bei einem einjährigen Knaben berichtet. Die Symptome waren die eines partiellen Darmverschlusses, und die mikroskopische Untersuchung ergab, dass der verdoppelte Darmabschnitt mit Magenschleimhaut ausgekleidet war. Geschwüre wurden nicht gefunden. Eine Resektion des verdoppelten Darmes und der anschliessenden Segmente wurde mit Erfolg ausgeführt.

RIASSUNTO

Viene riportato un caso di duplicazione intestinale interessante l'ileo in un bambino di un anno. I sintomi furono quelli di una ostruzione parziale e l'esame microscopico rivelò l'intestino duplicato e delimitato da mucosa gastrica. Non si trovarono ulcere. Si eseguì con successo l'operazione resecando l'intestino duplicato e i segmenti adiacenti.

REFERENCES

1. Gross, R. E.: The Surgery of Infancy and Childhood: Its Principles and Techniques. Philadelphia: The W. B. Saunders Company, 1953.
2. Hughes-Jones, W. E. A.: Enterogenous Cysts, Brit. J. Surg. 22:134, 1934.
3. Grove, E. W., and Porch, L. D.: Duplication of the Terminal Ileum; Report of a Case, Southern M. J. 30:735, 1954.
4. Edwards, H.: Congenital Diverticula of the Intestine, with Report of Case Exhibiting Heterotopia, Brit. J. Surg. 17:7, 1929.
5. Lewis, F. T., and Thyng, F. W.: The Regular Occurrence of Intestinal Diverticula in Embryos of the Pig, Rabbit and Man, Am. J. Anat 7:505, 1907.
6. Bremer, J. L.: Diverticula and Duplications of the Intestinal Tract, Arch. Pathol. 38:132, 1944.
7. Donovan, E. J., and Santulli, T. V.: Duplication of the Alimentary Tract: Report of Six Cases, Ann. Surg. 126:289, 1947.
8. Dohn, K., and Povlsen, O.: Enterocystomas, Acta Chir. Scandinav. 102:21, 1952.
9. Ripstein, C. B.: Duplication of the Small Intestine, Am. J. Surg. 78:847, 1949.
10. Johnston, J. B.; Hallenbeck, G. A.; Ochsner, A., and Dushane, J. W.: Duplications of Two Parts of the Alimentary Tract, Arch. Surg. 68:390, 1954.
11. Black, R. A., and Benjamin, E. L.: Enterogenous Abnormalities: Cysts and Diverticula, Am. J. Dis. Child. 51:1126, 1936.
12. Gross, R. E.; Holcomb, G. W., and Farber, S.: Duplications of the Alimentary Tract, Pediatrics 9:449, 1952.
13. Gardner, C. C. Jr., and Hart, D.: Enterogenous Cysts of the Duodenum: Report of a Case and Review of the Literature, J.A.M.A. 104:1809, 1935.

◆

It was the saying of an ancient sage that humor was the only test of gravity, and gravity of humor.

—*Shaftesbury*

Wit is the salt of conversation, not the food.

—*Hazlitt*

We often pretend to fear what we really despise, and more often to despise what we really fear.

—*Colton*

If we consider the frequent reliefs we receive from laughter, and how often it breaks the gloom which is apt to depress the mind, one would take care not to grow too wise for so great a pleasure of life.

—*Addison*

Total Gastrectomy: An Evaluation

E. S. BRINTNALL, M.D., F.A.C.S., KATE DAUM, Ph.D.,† R. C. HICKEY, M.D., F.A.C.S., R. T. TIDRICK, M.D., F.A.C.S., AND A. P. WICKSTROM, M.D.

IOWA CITY, IOWA

TOTAL gastric resection has become an acceptable surgical procedure for extensive carcinoma, but its evaluation as a therapeutic measure has been obscured by the generally unfavorable outcome directly attributable to the carcinoma. This study is an appraisal of results following resections performed for both benign and malignant disease.

Clinical Material. — During the eight years between 1947 and 1954, 58 patients underwent total gastric resection at the University Hospitals and the Veterans Administration Hospital in Iowa City. The procedure was carried out for carcinoma in 50 instances, lymphoma in 3 occasions, bleeding varices in 1, repeatedly recurrent marginal peptic ulcer in 1 and benign gastric ulcer in 3. Total gastrectomy was extended to include extirpation of adjacent solid or hollow viscera in 27 instances, exclusive of omentum and spleen, removal of these latter structures being routine in gastric cancer patients.

The lethal factors in the nine patients who died in the hospital following operation were determined by clinical appraisal in two instances and in seven instances by post-mortem examination. Five of the nine deaths were attributable directly to anastomotic leaks.[1]

The study was continuous from 1947 to include all treated patients, so that long-term and short-term follow-up evaluations are considered (Table 1). The follow-up studies were obtained through patient return visits and/or correspondence with either the referring physicians or the patients themselves. A composite recent questionnaire was sent to all living patients.

Particular attention was directed in follow-up to nutritional rehabilitation. The simplest expedient in appraisal was by direct interrogation and weighing of the patients. In most instances, chemical studies of the blood and other hematologic determinations were also made, and in 18 instances single or multiple five-day nutritional balance studies were conducted in the metabolic ward at various preoperative stages.

For the sake of expediency, the recorded preoperative weight of each patient was accepted as a base line for determining postoperative gain or loss in weight. The preoperative weights, however, were less by 1 to 53 pounds, or 0.1 to 24 Kg., (average 23 pounds, or 10.4 Kg.) than were the so-called normal weights as determined for 46 of the 58 patients. No allowance was made for loss of weight incident to the extensive operation and to preoperative and postoperative deprivation.

Technical Considerations. — Most patients subjected to total gastrectomy were being operated on for carcinoma, and the discussion here must center around this disease. The manner of extirpation was one widely accepted; included in an *en bloc* resection of the entire stomach were the greater or lesser omentum, spleen and several centimeters of duodenum and esophagus. Other adjacent viscera [illegible] removed in continuity [illegible]

From the Departments of Surgery and Nutrition, College of Medicine, State University of Iowa, and the Surgical Service of the Veterans Administration Hospital, Iowa City. Supported in part by a Cancer Grant, Account No. Q 292, of the College of Medicine of the University of Iowa.

†Deceased, Dec. 31, 1955.

TABLE 1.—*Overall Survival Following Total Gastrectomy (58 Patients, 1947-1954)*

Operative Mortality (hospital deaths)	9*	(16%)
Subsequent deaths	31	(53%)
(Death from cancer—22, of other cause)	7*	
Surviving (January 1955)	18	(31%)
At 5-7 yr., 3; at 3 yr., 3*)		
(At 6-18 mo., 8**; at 1-4 mo., 4)		

*Indicates a patient included who did not have cancer.

The manner of gaining access to the operative field and the method of anastomotic reconstruction of the alimentary tract constitute problems for discussion.

Easy and safe access to the operative field must be obtained. A stereotyped approach by the abdominal or the thoracoabdominal routine is undesirable. It has been our practice to evaluate the lesion initially through a transverse or vertical incision in the upper part of the abdomen. Frequently, total gastrectomy can be accomplished safely and with reasonable ease through an abdominal approach; the benefits of such an approach are reflected in shortening of the operating time and lessening of postoperative pain and bronchorespiratory distress. We are not reluctant, however, to extend the abdominal incision across the costal margin (with or without opening the pleura or resecting a rib) if the additional exposure is required for adequate *en bloc* resection or for a secure anastomotic reconstruction. The thoracoabdominal incision was elected as necessary for more than two-thirds of the patients. In no instance was an isolated thoracic approach utilized.

Four varieties of reconstruction were utilized: (a) simple jejunal loop anastomosis (Fig. 1*A*); (b) Roscoe Graham's procedure (Fig. 1*B*); (c) Roux *en Y* esophagojejunal anastomosis (Fig. 1*C*), and (d) direct esophagoduodenostomy.

Although the data are insufficient to justify significant statistical conclusions, the early postoperative mortality rate (all hospital deaths) is given for each type of anastomotic reconstruction.

Simple Jejunal Loop Procedures were carried out, with or without enteroanastomosis between jejunal limbs (Fig. 1*A*), on 14 patients; 5 (36 per cent) died in the hospital after the operation; 2 from peritonitis due to anastomotic leaks; 1 from cardiac arrest and pulmonary edema; 1 from pneumonia and 1 from massive pulmonary embolus.

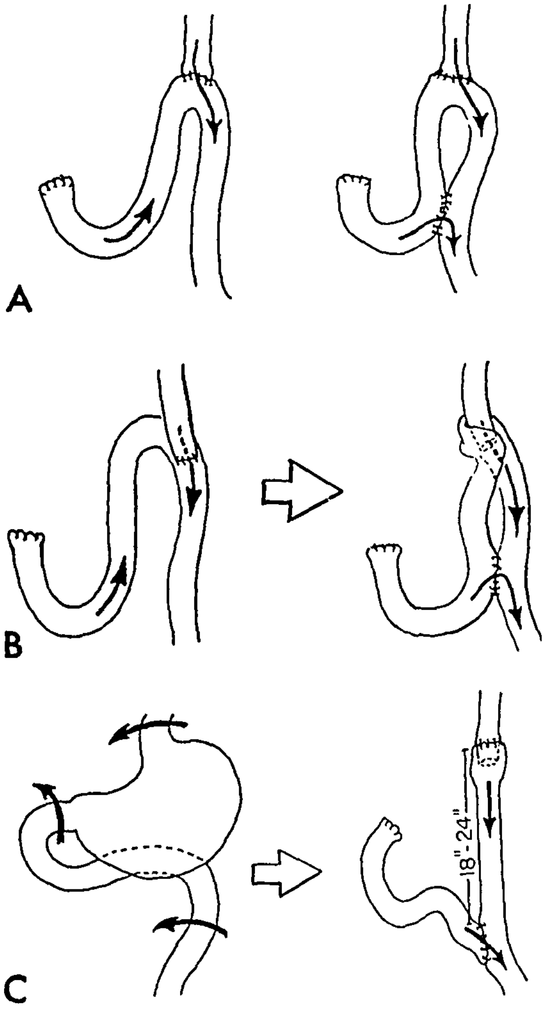


Fig. 1.—*A*, loop reconstruction after total gastrectomy. *Left*, simple loop reconstruction. *Right*, loop with lateral anastomosis. *B*, Roscoe Graham (folded loop) procedure. *C*, Roux "en Y" method of reconstruction.

TABLE 2.—*Simple Loop Reconstruction—Results in 9 Patients**

		Weight		*Postoperative*	
Patient	*Age*	*Preoperative*	*Postoperative*	*Complications*	*Results*
M. B.	72	135	133 (6 mo.)	Esophageal obstruction	Died, cancer (1 yr.)
G. K.	56	112	....	....	Died, cause? (2 mo.)
D. M.	46	164	123 (6 mo.)	Bile regurgitation	Died, cancer (1 yr.)
E. V.	68	112	87 (5 yr.)	Bile regurgitation	Alive, fair (5 yr.)
C. H.	45	128	128 (6 mo.)	....	Died, cancer (10 mo.)
R. M.	51	145	134 (5 mo.)	Bile regurgitation	Died, cancer (6 mo.)
M. G.	82	161	131 (2 mo.)	....	Died, cancer (6 mo.)
I. E.	54	102	....	....	Died, cause? (2 mo.)
J. W.	69	125	101 (5 mo.)	....	Died, cancer (7 mo.)

*Primary disease was gastric cancer in all 9 patients.

TABLE 3.—*Roscoe Graham Reconstruction—Results in 15 Patients*

		Weight		*Postoperative*	
Patient	*Age*	*Preoperative*	*Postoperative*	*Complications*	*Results*
E. S.	68	115	90 (7 mo.)	....	Died, cancer (8 mo.)
L. M.	60	104	84 (6 mo.)	Bile regurgitation	Died, cancer (6 mo.)
E. L.	69	123	132 (3 yr.)	Macrocytic anemia	Alive, 120 lbs. (7 yr.)
F. H.	63	105	97 (3 mo.)	....	Died, cause? (4 mo.)
K. M.	39	138	145 (1 yr.)	Macrocytic anemia	Alive, 140 lbs. (7 yr.)
N. K.	64*	150	130 (8 mo.)	....	Died, cause? (10 mo.)
C. C.	54	128	136 (3 mo.)	Bile regurgitation	Died, cancer (5 mo.)
C. A.	58	136	116 (6 mo.)	Esophageal obstruction	Died, starved (9 mo.)
J. H.	71	165	131 (4 mo.)	Esophageal obstruction	Died, stroke (1 yr.)
C. E.	76	145	137 (3 mo.)	Bile regurgitation Esophageal obstruction	Died, cancer (8 mo.)
A. E.	59	137	117 (2 yr.)	Bile regurgitation Esophageal obstruction	Died, cause? (27 mo.)
O. H.	58	115	103 (10 mo.)	Esophageal obstruction	Died, cancer? (1 yr.)
B. B.	35	85	73 (6 mo.)	Bile regurgitation	Died, cancer (10 mo.)
R. G.	56	125	140 (3 yr.)	....	Alive, well (3 yr.)
M. A.	57	155	111 (10 mo.)	Bile regurgitation Esophageal obstruction	Died, cancer (14 mo.)

*N. K. had benign gastric ulcer; others had cancer.

As a group, the 9 remaining patients did not do well after the operation. Bile regurgitation and esophageal symptoms occurred frequently. Food intake was generally poor, and only 1 patient gained enough weight to attain his preoperative weight level.[2] Some details of postoperative status and of survival are indicated in Table 2.

Dissatisfaction with this type of reconstruction has led us to abandon the procedure.

The Roscoe Graham Reconstruction (Fig. 1*B*) was performed on 17 patients.[3] There were two early postoperative deaths (12 per cent), one due to peritonitis from anastomotic leak, the other from renal failure.

This procedure allows for a more secure anastomosis, but bile and pancreatic juice bathe the distal portion of the esophagus at the anastomotic site unless the afferent jejunal limb is obstructed, and the entero-enterostomy is well distant (18 inches, or 45.7 cm.) from the esophagus. The latter objective could not be obtained with certainty. More than one-third of the patients specifically complained of bile regurgitation. This is a serious complication; it limits food intake and may be a cause of esophagitis.

Reference to Table 3 will reveal information concerning alterations in weight and periods of survival of the 15 patients who underwent the Roscoe Graham procedure.[2] Severe postoperative loss of weight occurred in most patients, particularly in those with bile regurgitation and symptoms of esophageal obstruction. Only 4 of the patients gained weight (one of these,

TABLE 4.—*Roux en Y Reconstruction—Results in 22 Patients*

		Weight			
Patient	*Age*	*Preoperative*	*Postoperative*	*Postoperative Complications*	*Results*
C. G.	65	142	138 (1 yr.)	....	Died, cause? (3½ yr.)
M. L.	72	103	105 (3 yr.)	....	Alive, well (3 yr.)
C. T.	53*	85	116 (3 yr.)	....	Alive, well (3 yr.)
J. M.	43	129	109 (6 mo.)	....	Died, cancer (1 yr.)
L. S.	46	140	160 (5 mo.)	....	Died, cancer (6 mo.)
I. M.	74	110	99 (4 mo.)	Intestinal obstruction	Died, cancer (6 mo.)
C. H.	65	120	....	....	Died, cancer (7 mo.)
J. C.	56*	194	135 (3 mo.)	....	Died, lymph. (3 mo.)
A. M.	70	123	120 (4 mo.)	....	Died, cancer (1½ yr.)
R. K.	42*	135	129 (1 mo.)	....	Died, lymph. (6 mo.)
J. B.	61	145	("gained")	....	Died, cancer (8 mo.)
L. H.	52	113	97 (1 yr.)	Esophageal stricture	Alive, 85 lbs. (1½ yr.)
E. W.	73	135	130 (3 mo.)	....	Died, cancer (10 mo.)
L. J.	57*	120	105 (14 mo.)	....	Alive, well (14 mo.)
H. F.	58	123	106 (10 mo.)	....	Alive, well (10 mo.)
M. M.	25*	115	96 (9 mo.)	Esophageal stricture Esophageal fistula	Alive, fair (9 mo.)
J. R.	77	130	....	....	Died, cancer (2 mo.)
H. L.	76	130	140 (6 mo.)	....	Alive, well (6 mo.)
M. H.	64	123	105 (6 mo.)	....	Alive, well (6 mo.)
R. L.	62	165	162 (1 mo.)	....	Alive, well (1 mo.)
J. P.	70	121	119 (1 mo.)	....	Alive, well (1 mo.)
E. D.	58	107	105 (1 mo.)	....	Alive, well (1 mo.)

*Patients 32 & 57—benign ulcer, 50—varices and 41 & 43—gastric & gen. lymph.

on being questioned, admitted to occasional mild bile regurgitation). One patient is alive and well at the time of writing, a little more than three years after gastrectomy for cancer. He gained 20 pounds (9.1 Kg.) after the operation, attaining his usual weight level of 140 pounds (67.6 Kg.). Another patient, living seven years after operation, gained 27 pounds (12.2 Kg.) after resection of cancer. Recently severe macrocytic anemia developed, and coincidental with this he lost weight. A fourth patient, living and well seven years after total gastrectomy and partial colectomy for extensive gastric cancer, gained 21 pounds (9.5 Kg.). After the resection macrocytic anemia developed, but this is controlled by administration of Vitamin B^{12} and folic acid.

The Roscoe Graham reconstruction plan has been relinquished, however, in favor of the simpler Roux *en Y* anastomotic reconstruction.

Roux en Y Reconstruction (Fig. 1C) was performed on 24 patients.

Efforts are directed specifically, in the *en Y* reconstructions, to prevent bathing the distal esophagus with digestive juices. The end-to-end esophagojejunostomy is 18 to 24 inches (45.7 to 60.9 cm.) proximal to the enteroenterostomy that delivers the bile and pancreatic juices into the reconstructed alimentary tract. By virtue of its peristalsis, intact jejunum of this length affords a protective physiologic barrier against reflux of these digestive juices onto the sensitive esophageal mucosa.

At the time of anastomosis, one vessel of the mesenteric arcade is usually sacrificed to facilitate approximating the jejunum to the esophagus without tension. Careful attention is directed toward maintaining a good blood supply to the ends of the jejunum, particularly to the end destined for anastomosis to the esophagus. The esophagus is "telescoped" into the end of the jejunum for a distance of 1.5 to 2 cm., to provide a wide zone of contact between the jejunal serosa and the muscularis of the esophagus. The end of the esophagus is widened by creating a heart-shaped terminal aperture, and the esophageal and jejunal mucosa are carefully approximated with interrupted fine catgut sutures to lessen the possibility of stricture.

Two patients (8 per cent) died in the hospital after the operation. One death was due to peritonitis from necrosis of the colon at the site of end-to-end anastomosis. The second death occurred nineteen days after the operation, from pancreatic necrosis with peritonitis.

Severe esophageal stomal stricture occurred in 2 patients. The cause of stomal narrowing in 1 of these is not known, and the stricture is responding poorly to transesophageal dilatation. In the second instance a difficult esophagojejunal anastomosis was accomplished under tension and with impaired vascularity. The patient had previously undergone esophagogastric resection for the control of recurrent near-exsanguinating hemorrhage from esophageal varices. Anastomotic leakage occurred after total removal of the stomach, and empyema developed. The resulting esophageal-pleural-cutaneous fistula has persisted. The stomal stricture is due to scarring on the basis of reduced blood supply and infection. Both of the patients with stricture failed to ingest adequate diets, and both lost weight. Another patient shows, on esophagoscopic study, an asymptomatic stomal narrowing but no esophagitis. Stricture of the end-to-end stoma is always a potential danger.

The data presented in Table 4 provide information concerning weight trends and survival in this group of patients.[2] Exclusive of the 2 patients with stomal stricture, the group tended to maintain or gain weight unless residual cancer was present clinically.

At the time of writing, the overall results of the *en Y* procedure appear more favorable than those of the other types of reconstruction.[4] The chief advantages of the *en Y* method is protection against regurgitation of bile and pancreatic juice. Another apparent advantage is the general tendency of the patients to accept food earlier after operation and in larger quantities during the period of survival. We are unable to explain why they tolerate larger feedings.

We are interested in current trials of reconstructive procedures that interpose a "gastric replacement reservoir" between the esophagus and the duodenum. Valid evidence is awaited to show that such procedures are as safe as those we now employ and that the theoretical advantages of a reservoir and of channeling food through the duodenum are mirrored in the clinical results.

Direct esophagoduodenal anastomosis was carried out after total gastric resection in 3 patients. Two of these patients survive. All lost weight.[2] The 2 surviving patients suffer from bile regurgitation. Table 5 contains information about these patients.

No conclusions can be derived from experience with this trio of patients except that the procedure does not protect against regurgitation of bile and pancreatic juice into the esophagus.

Nutrition.—Nutritional balance studies were made of 18 unselected totally gastrectomized patients with esophagojejunal reconstructions. Two had benign gastric ulcer. No fundamental difference existed in the utilization of ingested food either between patients with the anatomically varied reconstructions or between patients with benign lesions or clinically controlled cancers. The type of reconstruction and the primary disease affected food intake but not digestion *per se.*

The nutritional problems revolved mainly around food intake. Appetite tended to be poor, particularly in elderly patients, in patients with residual cancer, in patients with bile regurgitation and in all patients in the early postoperative phase. Mechanical obstruction due to esophagitis, to esophageal stomal stricture, or to recurrent cancer prevented adequate food intake also. The food intake problem was particularly troublesome in patients with bile regurgitation. Such patients had difficulty, usually from esophageal spasm on taking food, and they complained of pain and the taste of bile.

The patients lacked a normal food capacity after operation. The quantity capacity in patients with the *en Y* reconstruction corresponded to the capacity of patients with the Maydl jejunostomy.[5] Interval feedings in midforenoon, in midafternoon and at bedtime were required in addition to the three larger regular meals. The interval meal consisted often of a sandwich and milk.

Forty-two determinations of fat in the stools were made in 11 instances. Faulty fat absorption was noted in the early postoperative period.[6] Several weeks after operation the stool fat levels tended to approach the normal; normal levels were attained, however, in only 4 of the 11 patients. The method of reconstruction of the alimentary tract exerted no influence upon the efficacy of fat digestion. Studies of stool fat balance on 6 patients are presented in Table 6B.

Proteins were well utilized in the absence of the stomach.[7] Table 6 indicates nitrogen balance data on 18 patients. A negative nitrogen balance was noted usually in the early postoperative period. The fecal nitrogen loss was not excessive after a postoperative period of readjustment. The type of anatomic reconstruction utilized after gastrectomy had no apparent effect upon the utilization of ingested protein.

Twenty-nine double dextrose tolerance

TABLE 5.—*Direct Esophagoduodenostomy—Results in 3 Patients*

Patient	*Age*	*Weight* *Preoperative*	 *Postoperative*	*Postoperative Complications*	*Results*
L. T.	56	175	137 (8 mo.)	Bile regurgitation	Alive, well (1 yr.)
A. C.	75	108	98 (1 mo.)	Diarrhea; Nausea; Vomiting	Died, cancer (4 mo.)
F. T.	75	126	112 (4 mo.)	Bile regurgitation	Alive, well (4 mo.)

curves were studied for 14 unselected patients. A distinct tendency toward a hyperglycemic curve was demonstrated in 8 nondiabetic patients (Fig. 2). In only 1 such patient did symptoms develop (nausea, flush, palpitation), and he obtained relief by taking a diet high in protein and low in readily available carbohydrate.[8] The double dextrose tolerance studies made in the early postoperative period showed hyperglycemia. When repeated one or more times at intervals several weeks or months later, they did not show a persistent pattern but were normal, hypoglycemic or hyperglycemic. The type of postgastrectomy reconstruction did not alter these results.

Positive balances of calcium and phosphorus were obtained on ordinary intake of these minerals. Utilization of these substances was determined in 17 patients and is indicated in Table 6A.

Reference to Table 6B will show that the totally gastrectomized patient needs an increased oral iron intake for effective nutritional balance.[9] As the patients frequently would select diets low in iron, they were urged to take iron in medicinal form

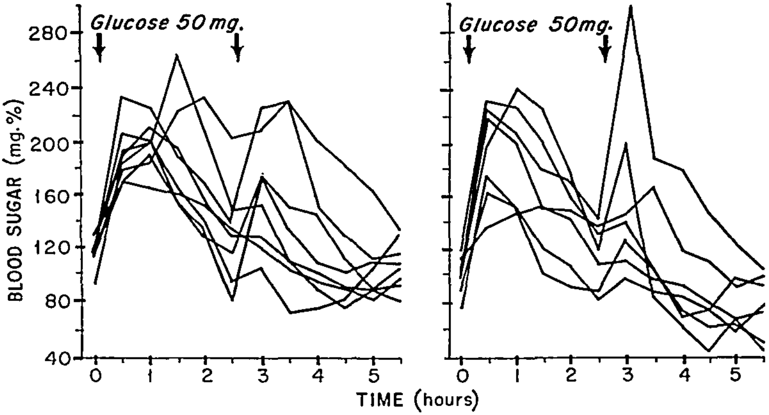


Fig. 2.—Double studies, early (*left*) and late (*right*) in the postoperative period, of dextrose tolerance. Early (six to twelve weeks after the operation) the curves for 8 patients were predominantly hyperglycemic. Later (three months after the operation) the curves for 7 patients [illegible] no consistent pattern.

TABLE 6A.—*Postoperative Balance Studies of 17 Gastrectomized Patients: Utilization of Nitrogen, Calcium and Phosphorus*

Patient	*Age*	*Mo. P.O.*	*Pro-cedure*	*Caloric Intake*	*NITROGEN (Gms.)*				*CALCIUM (Gms.)*				*PHOSPHORUS (Gms.)*			
					Intake	*Urine*	*Feces*	*Bal.*	*Intake*	*Urine*	*Feces*	*Bal.*	*Intake*	*Urine*	*Feces*	*Bal.*
E. L.	69	½	R. G.	2,340	12.50	7.10	3.10	2.30	1.467	0.045	1.341	0.081	1.575	0.651	0.834	0.091
E. L.	69	16	R. G.	2,300	12.50	10.26	1.54	0.70	1.501	0.049	1.263	0.190	1.679	0.754	0.706	0.219
E. L.	69	31	R. G.	2,400	12.50	8.19	0.81	1.50	1.621	0.051	1.311	0.259	1.786	0.806	0.695	0.285
E. L.	69	84	R. G.	2,830	16.53	11.68	1.12	3.73	2.142	0.067	1.625	0.450	2.248	0.771	0.848	0.629
F. H.	63	½	R. G.	2,000	11.40	7.48	6.89	—2.97	1.493	0.107	1.466	—0.080	1.734	0.982	0.911	—0.159
F. H.	63	5	R. G.	2,140	14.00	11.16	1.23	1.61	1.676	0.137	1.321	0.218	1.845	1.009	0.661	0.175
N. K.	64	10	R. G.	4,000	18.80	12.50	1.52	4.78	2.140	0.280	1.306	0.554	2.127	1.354	0.472	0.301
C. C.	54	1	R. G.	2,140	15.30	11.09	3.81	0.40	1.842	0.053	1.662	0.127	1.908	1.250	0.355	0.323
J. H.	71	10	R. G.	1,980	14.10	11.58	1.00	1.52								
C. E.	76	½	R. G.	700	4.80	6.50	1.47	—3.17	0.783	0.021	0.777	—0.015	0.703	0.407	0.452	—0.156
C. E.	76	3	R. G.	2,950	17.20	10.38	2.28	4.54	2.494	0.032	2.139	0.323	2.413	0.793	0.598	1.022
A. E.	59	½	G. G.	1,980	12.30	9.30	2.12	0.88	1.476	0.117	1.796	—0.337	1.607	0.609	0.745	0.253
A. E.	59	3	R. G.	2,760	21.05	10.44	2.52	8.09	2.164	0.155	1.532	0.477	2.466	0.144	0.637	0.685
O. H.	48	10	R. G.	1,600	9.81	8.10	*	1.71	1.162	0.918	*	0.244	1.281	0.931	*	0.350
B. B.	35	6	R. G.	960	6.31	5.62	*	0.69	0.742	0.760	*	—0.018	0.698	0.676	*	0.022
M. B.	72	⅓	Loop	680	5.57	4.70	2.10	—1.23	0.683	0.021	0.677	—0.015	0.703	0.507	0.253	—0.057
D. M.	46	⅓	Loop	2,360	16.10	14.05	1.18	0.87	1.842	0.156	1.521	0.165	1.908	0.986	0.706	0.216
E. V.	68	¾	Loop	1,180	8.82	6.70	1.41	0.71	1.161	0.028	0.986	0.157	1.096	0.346	0.601	0.149
E. V.	68	48	Loop	1,479	11.24	10.07	0.86	0.31	1.301	0.032	1.089	0.180	1.243	0.277	0.841	0.125
C. H.	45	½	Loop	1,680	9.06	6.84	2.20	0.02	1.038	0.065	0.963	0.010				
C. G.	65	17	En-Y	1,090	7.81	5.71	3.16	—1.06	1.145	0.101	1.076	—0.032	1.032	0.385	0.675	—0.028
C. G.	65	29	En-Y	1,540	8.94	5.67	2.50	0.77	1.302	0.115	0.914	0.273	1.216	0.402	0.535	0.279
M. L.	72	2	En-Y	1,600	8.32	5.58	4.50	—1.76	1.105	0.313	0.823	—0.031	1.080	0.649	0.431	0.000
M. L.	72	27	En-Y	2,178	14.17	10.14	4.17	—0.14	1.575	0.127	1.213	0.235	1.715	0.847	0.395	0.473
I. M.	74	¾	En-Y		6.88	6.99	*	—0.11	0.768	0.052	0.676	0.040	1.089	0.621	0.389	0.079
I. M.	74	4	En-Y		5.84	4.88	0.84	0.12	0.646	0.045	0.536	0.065	0.893	0.581	0.276	0.036
A. W.	73	4	En-Y	1,687	11.85	8.55	1.01	2.29	1.500	0.032	1.302	0.166	1.475	0.797	0.322	0.356
L. J.	57	⅓	En-Y	1,130	10.65	7.18	4.70	—1.23	1.369	0.018	1.752	—0.401	1.419	0.381	0.999	0.039
L. J.	57	5	En-Y	2,130	14.40	10.05	2.43	1.92	1.609	0.038	1.424	0.147	1.647	0.590	0.762	0.295

*Mixed Urine and Feces

R. G.—Roscoe Graham Reconstruction
Loop—Loop reconstruction
En-Y—Roux En Y reconstruction

TABLE 6B.—*Postoperative Balance Studies of 17 Gastrectomized Patients: Data on Caloric Intake and on Intake and Excretion of Fat, Iron, Thiamine and Niacin*

					FAT		*IRON*				*THIAMINE*		*NIACIN*	
Patient	*Age*	*Mos. P.O.*	*Pro-cedure*	*Caloric Intake*	*Intake, Gm.*	*Feces, Gm.*	*Intake, Mg.*	*Urine, Mg.*	*Feces, Mg.*	*Bal. Mg.*	*Intake, Mg.*	*Excre-tion, %*	*Intake, Mg.*	*Excre-tion, %*
E. L.	69	31	R. G.	2,400	104	6.1	10.55	0.58	9.84	0.13				
E. L.	69	84	R. G.	2,830			12.38	0.20	11.12	1.06	1.37	6.5	11.52	32.2
N. K.	64	10	R. G.	4,000	134	4.6								
C. E.	76	½	R. G.	700			3.01	0.10	6.34	—3.43				
C. E.	76	3	R. G.	2,950			13.40	0.08	14.30	—0.98				
A. E.	59	½	R. G.	1,980			11.43	0.09	12.80	—1.46				
O. H.	48	10	R. G.	1,600	73	5.1	8.82	0.98	8.00	—0.16				
B. B.	35	6	R. G.	960			2.76	*	5.02	—2.26				
M. B.	72	⅓	Loop	680	51	5.8	2.64	0.77	3.02	—1.15				
E. V.	68	¾	Loop	1,180			7.71	0.65	7.01	0.05				
E. V.	68	48	Loop	1,479			8.58	0.31	6.96	1.31	0.80	13.9	7.06	88.8
C. G.	65	17	En-Y	1,090			4.01	0.43	3.61	—0.03	0.66	4.4	4.21	183.3
C. G.	65	29	En-Y	1,540	52	5.8	5.56	0.23	9.79	—4.26				
M. L.	72	27	En-Y	2,178			11.09	0.36	15.60**	—4.87	1.21	16.9	11.88	39.0
I. M.	74	¾	En-Y				3.21	0.57	4.51	—1.87				
I. M.	74	4	En-Y				2.91	0.60	3.36	—1.05				
A. W.	73	4	En-Y	1,687			11.65	0.32	11.14	0.19	0.65	9.4	6.60	86.8
L. J.	57	⅓	En-Y	1,130			9.60	0.31	9.01	0.28	0.76	7.1	6.03	18.1
L. J.	57	5	En-Y	2,130	91	9.1	8.45	0.16	7.70	0.59	1.29	4.4	10.25	34.5

*Mixed Urine and Feces

**Contamination

R. G.—*Roscoe Graham reconstruction*

Loop—Loop reconstruction

En-Y—Roux En Y reconstruction

to supplement the dietary iron.

Thiamine and niacin balance determinations were made in 7 patients and are indicated in Table 6B.[10]

Standard methods of analysis were used in the balance studies recorded in Tables 6A and 6B.[11]

Hemopoietic Data.—Macrocytic hyperchromic anemia developed in 2 patients three and six years respectively after total gastrectomy for cancer. These types of anemia are controlled by administration of Vitamin B^{12} and folic acid orally .to 1 patient and Vitamin B^{12} parenterally to the other.[12] A number of the patients have been given continuous therapy with Vitamin B^{12} and folic acid. It is possible that all patients who have undergone total gastrectomy should be given these agents as a prophylactic measure.

No instances of true iron deficiency anemia were noted, but all patients were given supplemental iron therapy.

SUMMARY

Total gastrectomy was performed on 58 patients during the eight-year period from 1947 to 1954, for carcinoma in 50 instances, lymphoma in 3, bleeding varices in 1, repeatedly recurrent marginal ulcer in 1 and benign gastric ulcer in 3. Total gastrectomy was extended to include extirpation of adjacent solid or hollow viscera in 27 instances (exclusive of omentum and spleen), removal of these structures being routine in the treatment of patients with gastric cancer. Nine patients died in the hospital after the operation (operative mortality rate, 16 per cent).

The *en Y* type of reconstruction was most favorable in the authors' experience and was performed on 24 patients. Other methods of reconstruction included anastomosis of a jejunal loop to the esophagus in 14, the Roscoe Graham procedure in 17, direct esophagoduodenostomy in 3.

The nutritional problem revolved mai ly around food intake. Balance studies protein, fat, calcium, phosphorus, iro thiamine and niacin revealed satisfactor utilization. Only iron was required larger than normal amounts to obtain positive balance. Macrocytic anemia d veloped in 2 patients, who were otherwis well seven years after operation (18 of th 58 patients are living at the time writing).

CONCLUSION

Gastrectomized patients with the *en* reconstruction generally ate better an lived more comfortably after the opera tion than did patients with other types o reconstruction.

The chief postoperative problem con cerns food intake. Studies of food balanc indicate that ingested dietary elements ar assimilated and utilized satisfactorily.

The operative death rate (16 per cent is sufficiently low to justify the procedur but sufficiently high to militate against it routine use for all gastric cancer.

Hyperchromic anemia may develo after total gastrectomy.

Author's Note: Grateful acknowledgement i expressed to Rosetta Cerny, Carrie Jean Hodg Ruth Johnson, Ruth Kennedy, Edga Page, Theres Nowachek, and Sarah M. Quinn, who carried ou the balance studies as a partial requirement fo the M.S. degree in Nutrition.

RÉSUMÉ

De 1947 á 1954, 58 malades ont sub une gastrectomie totale, dont 50 cancers 3 lymphomes, 1 varices hemorragiques, ulcère marginal récurrente et 3 ulcère gastriques bénins. La gastrectomie total comprenait une extirpation de viscère creux ou solides adjacents dans 27 cas L'épiploon et la rate sont génèralemen extirpés chez tous les carcinomes gastri ques. Neuf malades sont mort á l'hôpita

de suites opératoires, produisant une mortalité opératoire de 16%.

Le Roux-en-Y type de reconstruction a donné les résultats les plus favorables et fut employé chez 24 malades. Les autres methodes de reconstruction employées furent la bride jejunale-oesophagienne dans 14 cas, l'opération de Roscoe Graham dans 19 cas, et oesophago-duodénostomie directe dans 3 cas.

L'ingéstion de nourriture posait une problème de nutrition important. Les recherches sur la balance des protéines, des graisses, du calcium, phosphore, fer, thiamine et niacin ont montré une utilization satisfaisante. Il n'y a que le fer qui ait exigé une plus grande quantité pour obtenir une balance positive. Beux malades ont dévelopé une anémie macrocytique sans avoir d'autres symptomes pendant une période de 7 ans après l'opération. Des 58 malades opérés, 18 sont encore en vie aujourd'hui.

SCHLUSSFOLGERUNGEN

Die Kranken in der Serie der Verfasser konnten im allgemeinen besser essen und mit geringeren Beschwerden leben als diejenigen, an denen im Anschluss an eine Magenresektion eine andere Form der Anastomose als die Y-förmige ausgeführt worden war.

Das wichtigste Problem in der Zeit nach der Operation bildet die Nahrungsaufnahme. Untersuchungen der Ernährungsbilanz ergeben, dass die aufgenommenen Nahrungsmittel ausreichend assimiliert und ausgenützt werden.

Die Quote der Operationssterblichkeit (16 Prozent) ist gering genug um die Ausführung des Verfahrens zu rechtfertigen, aber hoch genug, um gegen eine routinemässige Anwendung in allen Fällen von Magenkrebs zu sprechen.

Als Folge einer totalen Gastrektomie kann eine hyperchrome Anämie entstehen.

RIASSUNTO

Nell'esperienza degli autori gli operati di gastrectomia con ricostruzione a Y stanno meglio ed hanno ottenuto un miglior risultato rispetto ad altri operati con tipi diversi di anastomosi. Il problema più importante nel periodo post-operatorio è rappresentato dall'alimentazione; gli studi sul bilancio alimentare dimostrano che in questi malati l'utilizzazione e l'assimilazione dei cibi è soddisfacente. La mortalità operatoria (16%) è sufficientemente bassa da giustificare il metodo, ma non tale da renderlo consigliabile in tutti i carcinomi gastrici indiscriminatamente. Dopo gastrectomia totale può manifestarsi un' anemia ipercromica.

REFERENCES

W. H.: Practical Physiological Chemistry. Philadelphia and Toronto: The Blakiston Company, 1947. 12th ed.

12. Paulson, M., and Harvey, J. C.: Hematological Alterations After Total Gastrectomy, J.A.M.A. 156:1556-1560, 1954.

Important Announcement For 1957!

The Tenth International Scientific Congress of the International College of Surgeons will be held at the invitation of the Mexican Government and under the Honorary Presidency of His Excellency, Don Adolfo Ruiz Cortinez, President of the Republic of Mexico, February 24-28 inclusive, 1957, at University City, Mexico, D. F. The Grand Opening Ceremony will take place at the Palace of Fine Arts, and the scientific sessions in the University buildings.

For further details address:
International College of Surgeons
1516 Lake Shore Drive
Chicago 10, Illinois

Attention: Secretary, Mexican Congress

A Review of Two Hundred Gastrectomies

GERALD B. REAMS, M.D., Captain USAF (MC)
MIAMI, FLORIDA

GASTRECTOMY is an accepted surgical procedure both for malignant disease of the organ and for medical failures in treatment of the peptic ulcer diathesis. Much has been written on various technics, the immediate mortality and morbidity rates, and the long-term results. Much that has been written has emanated from specific medical centers for the express purpose of guiding the general surgeons throughout the country. It is well to analyze the impact of this writing on the clinical surgeon, who in the nature of things, is a true general surgeon in the overall sense and, as such, performs gastrectomies not as one limited to such procedures but merely as one who employs yet another procedure when and if confronted with the appropriate problem. It is conceivable that the various procedures suggested might have results in the hand of the qualified surgeon who occasionally performs a gastrectomy that differs from the results of the same procedure when performed by one whose major interests and endeavors are directed toward gastric surgery.

Articles have been written about leaving the duodenal ulcer rather than extirpating it, catheter drainage of the difficult duodenal stump, early resection of bleeders in the upper part of the gastrointestinal tract and the utilization of gastric resection when no specific source of hemorrhage can be demonstrated at the time of operation. With these things in mind, I have attempted to survey the immediate results of 200 gastric resections performed at the Jackson Memorial Hospital between October 1951 and September 1954. This period was selected because it was one during which a fairly high percentage of the qualified surgeons of the State of Florida were concentrated in the Miami area. (In 1954, 30 per cent of all Board-certified specialists were located in this area.) During this period a surgical residency program was carried out under the voluntary supervision of the surgeons of Dade County. The

TABLE 1.—*Postoperative Diagnosis*

Duodenal ulcer	127
Gastric ulcer	27
Gastric tumor (malignant)	17
(benign)	4
Marginal ulcer	2
Gastritis	13
No abnormality	10

TABLE 2.—*Previous Gastric Operations*

Closure of perforation	14
Gastroenterostomy	4
Subtotal gastrectomy	2
Pyloroplasty	2
Gastrostomy	2
Feeding jejunostomy	2

TABLE 3.—*Operations*

Subtotal gastrectomy	191
Radical subtotal	3
Total gastrectomy	4
Esophago-gastrectomy	2

From the Department of Surgery, Jackson Memorial Hospital, and the University of Miami School of Medicine, Miami.

Read at the Twentieth Annual Congress of the United States and Canadian Sections, International College of Surgeons, Philadelphia, Sept. 12-15, 1955.

Submitted for publication Nov. 9, 1955.

TABLE 4.—*Complications*

Surviving patients	177
Number of patients with complications	40
Morbidity rate, %	22.5
Total Number	52
Pulmonary	13
Cardiovascular	8
Gastrointestinal	
Duodenal stump leakage	8
Stomal obstruction	6
Postoperative hemorrhage	5
Urinary	5
Local wound	7

TABLE 5.—*Death*

Duodenal stump leakage	10
Immediate postoperative	7
Pulmonary complications	3
Stomal obstruction	2
Myocardial infarction	1

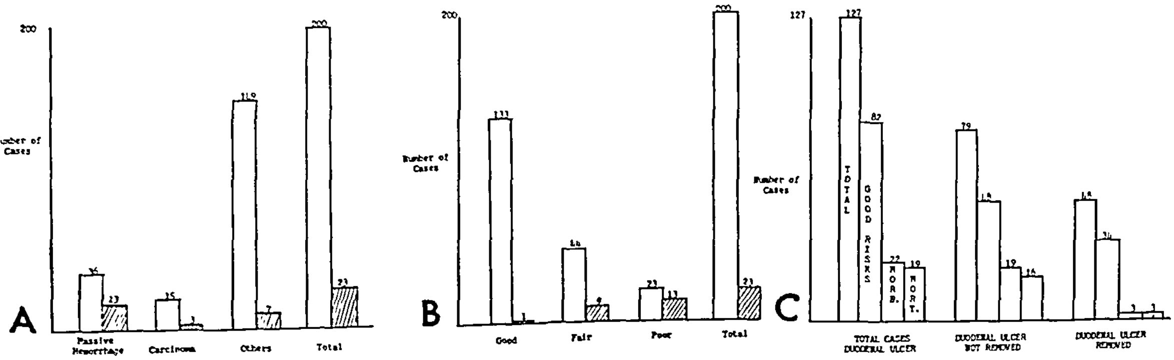
study is terminated as of September 1954, since this coincides with the time the University of Miami School of Medicine, as the teaching hospital of the medical school at the Jackson Memorial Hospital, assumed the responsibility for care of indigent patients and promulgation of the residency program. The Jackson Memorial Hospital is a county institution of 950 beds. It cares for private and staff patients in approximately equal proportions.

A previous study made by Dr. Joseph S. Stewart[1] of the surgical staff represents the interval between July 1944 and December 1949, with a total of 120 gastrectomies. This excellent study serves as a base line for comparison of gastrectomies performed at the same hospital during two recent periods.

The cases reviewed are consecutive. They include both emergency and elective operations, for the reasons listed. The operations in this series (200 gastrectomies) were performed both by the attending and the resident staff. Of the 200 patients, 125 were private and 75 were staff. The average age of the patients in this series was 50.2 years.

The symptoms varied. Epigastric pain, persistent vomiting and loss of weight were the complaints most commonly presented. Twenty-five patients had previously undergone operations for ulcer. These earlier procedures included 4 gastroenterostomies, 14 procedures for closure of an ulcer perforation, 2 subtotal gastrectomies, 2 jejunostomies for feeding, 2 pyloroplasties and 2 gastrectomies with suture of the bleeding point.

Preoperatively, 133 were rated as good surgical risks; 44 as fair risks; 20 as poor risks, and 3 as extremely poor risks. The



A, comparison of mortality rates. *B*, relation between preoperative evaluation and mortality. *C*, comparison of morbidity and mortality rates.

TABLE 6.—*Results* [illegible]

Author	*Gastrectomies*	[illegible]	[illegible]	[illegible]	*rs' Comments*
Stewart[1]	120	Duode[illegible] ulcers, gastric carcinoma			[illegible] General Hospital not associated with a teaching center
Lahey[2]	660	Resections for Duodenal ulcer	2.57		Mortality is lowered with removal of the ulcer
	221	Gastric ulcer	3.1		
	69	Jejunal ulcer	4.3		
		Gastrocolic fistula	10.7		
Ogilvie[3]	1,456	48% chronically ill and aged	2.7		
American Gastroenterological Association[4]	1,036 108	Duodenal ulcer and jejunal ulcer	3.3		Previous history of hemorrhage decreases good results and removal of ulcer lowers mortality
Marshall[5]	1,079	Duodenal and gastric ulcers	2.4		Subtotal gastrectomy is still the most important surgical method of ulcer treatment
Strauss[6]	950	Without suction	3.5		
	846	With suction	1.4		
St. John[7]	394	Duodenal and gastric ulcers not including emergencies for bleeding	4.6		
Mayo Clinic[8]	(Approx.)	All gastrectomies—			Deaths most frequently due to peritonitis, pneumonia and hemorrhage
	1,000	1948	3.8		
	1,000	1949	2.4		
	1,000	1950	2.7		
		1951	3.9		
Potter[9]	203	Elective benign gastric ulcers	3.1	36	Detected no difference in morbidity between the group over and the group under 50 years old
Palumbo[10]	98			28.8	Peritonitis, pulmonary complications and obstructions were the most frequent complications
Larsen[11]	55	Ulcers with intractable pain or vomiting	10		High mortality due to difficulty in closing an acutely inflamed duodenal stump
Smith[12]	474	Benign gastric ulcer	4.85		
	60	Gastric carcinoma	3.3		
Rumball[13]	22	Massive bleeding 14—duodenal ulcer 3—gastric ulcer 5—cause undetermined	32.0		22 out of 302 admissions for massive upper hemorrhage of upper part of gastrointestinal tract
Stewart[14]	30	Done within 24 hours of onset of recurrence of massive bleeding in ulcer patients	17		Mortality is decreased if gastrectomy is done within 24 hours
	(21)	Treated medically	29		
Welch, C. S.[15]	3	Massive hemorrhage of ulcer origin	66		Age is an important factor. Medically treated patients over 50 showed 20% mortality; those under 50, 2%
	(125)	Medically treated	8.8		
Welch, C. E.[16]	45	Massive gastroduodenal hemorrhage	22		If resection was done in the first 48 hours the mortality was 10%; after 48 hours, 54%
	(213)	Medically treated	11		
Gott[17]	18	Massive hemorrhage	6		A comparative study of nonoperative and operative treatment of massive gastrointestinal hemorrhage
	(172)	Medically treated	6		
Olander[18]	29	Gastrectomy	10	37	Surgical patients with massive [illegible] part of [illegible]
	5	Gastrectomy			

usual preoperative medication consisted of a barbiturate on the night before the operation, with morphine and hyoscine administered as a preoperative hypodermic.

The operations performed are listed. The type of anesthesia most commonly used was that of a Pentothal induction with cyclopropane maintenance. A left paramedian incision was the type most commonly used, and an anterior Polya type of anastomosis was used in the majority of cases for the reestablishment of continuity.

A patient was considered febrile if on any day following, but not including, the day of operation, the temperature was 100 F. or above. Of 135 patients given postoperative antibiotics, 77 per cent were febrile for an average of three and four-tenths days. Of the 58 patients not given postoperative antibiotics, 31 per cent were febrile for an average of two and nine-tenths days. The average stay in the hospital was eighteen and one-half days, six days being spent prior to operation and twelve and one-half thereafter. Postoperative gastric suction was used in 189 patients for an average period of five and one-half days. There were 23 deaths in the series, and 52 postoperative complications occurred in 40 of the 77 survivors.

SUMMARY

1. There were 23 deaths in the total series, a mortality rate of 11.5 per cent. For emergency gastrectomies for massive hemorrhage the mortality rate was 36.1 per cent; gastrectomies for carcinoma carried a 20 per cent mortality rate; if these are excluded from the total number of cases there was a mortality rate of 4.7 per cent.

2. There were 40 patients with 52 postoperative complications among the surviving 177, a morbidity rate of 22.5 per cent. The most common complications were pulmonary disorders, leakage from the duodenal stump, stomal obstruction and hemorrhage.

3. Twenty-five patients, or 12.5 per cent of the total series, had undergone previous surgical treatment for ulcer.

4. The most frequent reason for operation was a duodenal ulcer, with hemorrhage present in 50 cases, or 25 per cent of the total series.

5. An emergency operation was required in 36 cases, or 18 per cent of the total series, because of massive hemorrhage.

6. A subtotal gastrectomy with an anterior Polya type of anastomosis was the operation most frequently performed.

7. There were 15 gastrectomies for carcinoma, 1 for reticulum cell sarcoma and 1 for leiomyosarcoma.

8. Eight gastrectomies were done for massive upper intestinal bleeding in which no bleeding point could be found at operation. Four of the patients did well; 2 had postoperative pulmonary complications; 1 had a postoperative recurrence of hemorrhage requiring 2,000 cc. of blood before recovery, and 1 died six hours after the operation, never having recovered from the anesthesia.

9. A duodenal ulcer was felt to be present at surgery in 127 cases. It was removed in 48 cases with a mortality rate of 8.3 per cent and a morbidity rate of 7 per cent among the survivors. The duodenal ulcer was not removed in 79 cases, in which the mortality rate was 21 per cent and the morbidity rate 31 per cent.

10. In the 36 cases operated on for massive hemorrhage the average interval between admission and operation was sixty-two hours for the survivors and one hundred and thirty-two hours for those who died.

11. For 146 patients less than 2,500 cc. of blood was required; the mortality rate among these was 5.5 per cent. For the 54 patients who required more than 2,500 cc.

of blood the mortality rate was 28 per cent.

CONCLUSIONS

On the basis of the data summarized from the cases presented, four important concepts are suggested:

1. The mortality rate for gastrectomy is higher for the qualified surgeon who occasionally performs it than for the surgeon who specializes in this procedure.
2. On the basis of this series it would appear that the morbidity and mortality rates associated with gastrectomy for duodenal ulcer are lowered if the ulcer itself is removed.
3. A subtotal gastrectomy done empirically, even though no bleeding point is found at the time of celiotomy, gives satisfactory results.
4. The mortality rate of emergency gastrectomy for massive hemorrhage is lowered in proportion to the promptness with which the operation is performed after replacement of blood.

RÉSUMÉ

1. Il y avait 23 décès dans la serie entière, c'est 11,5% de mortalité. La mortailité des gastrectomies urgentes pour des hémorrhagies massives était de 36,1%. La mortalité des gastrectomies pour carcinoma était de 20%. Si on déduit ceux-ci du nombre total des cas, il y avait une mortalité de 4.7%.
2. De 177 patients qui survivaient, 40 avaient ensemble 52 complications postopératoires, une morbidité de 22,5%. Les complications les plus communes étaient des dérangéments pulmonaires, de la fuite du tronc duodénal. occlusion de l'anastomose et hémorrhagie.
3. 25 patients ou 12,5% de la série totale avaient subi un traitement chirurgical précédent pour des ulcères.
4. La plus frequent indication pour l'opération était un ulcère duodénal saignant, chez 50 malades, ou 25% de la série totale.
5. Une opération urgente était nécessaire dans 36 cas, ou 18% de la serie totale pour une hémorrhagie massive.
6. L'opération executée dans la plupart des cas était la gastrectomie subtotale avec anastomose antérieure du type de Polya.
7. 15 gastrectomies furent exécutées pour carcinoma, une pour un reticulum cell sarcoma et une pour un leiomyosarcoma.
8. 8 gastrectomies étaient pour des hémorrhagies massives intestinales supérieures, ou la source de l'hemorrhagie ne fut pas trouvée a l'opération. De ces patients 4 se remettèrent bien, 2 avaient des complications pulmonaires postopératoires, 1 eut un recidive postopératoire de l'hémorrhagie nécessitant une transfusion sanguine de 2 litres avant de se remettre et un mourut 6 heures après l'opération, sans se remettre de l'anesthésie.
9. Un ulcère duodénal fut trouvé pendant l'opération a 127 patients. Il fut extirpé 48 fois avec une mortalité de 8,3% et une morbidité de 7% chez les survivants. L'ulcère duodenal ne fut pas extirpé en 79 cas, dans lesquelles la mortalité était de 21% et le morbidite 31%.
10. L'interval moyen entre admission et opération chez les 36 patients, qui furent opérés pour une hémorrhagie massive était 62 heures pour ceux qui survivaient et 132 heures pour ceux qui mouraient.
11. Pour 146 patients des transfusion de moins que 2500 cc de sang étaient necessaires. La mortalité de [illegible] était

---

Author's Note: The author is indebted to John J. Farrell, M.D., Chairman, Department of Surgery, University of Miami School of Medicine, for his help in the preparation of this paper. Appreciation is also given to the Department of Medical Illustration, University of Miami School of Medicine for their assistance.

5.5%. La mortalité des 54 patients qui avaient besoin de plus que 2500 cc de sang était 28%.

CONCLUSIONS

En résumant on tire 4 conclusions importantes de ces cas présentés:

1. La mortalité pour les gastrectomies est plus haute chez les chirurgiens qualifiés, qui l'exécutent de temps en temps, que chez ceux, qui sont des experts de cette procédure.

2. Suivant cette série il parait, que la mortalité et morbidité après une gastrectomie pour ulcère duodenal est moins haute, si l'ulcère même est enlevé.

3. Une gastrectomie subtotale faite par expérience, même que la source de l'hémorrhagie n'était pas trouvée pendant la caeliotomie donne des résultats satisfaisants.

4. La mortalité d'une gastrectomie urgente pour une hémorrhagie massive est diminuée proportionalément à la promptitude de l'opération après remplacement de sang.

ZUSAMMENFASSUNG

1. In der gesamten Serie von Kranken kamen 23 Todesfälle vor, was einer Sterblichkeitsquote von 11,5 Prozent entspricht. Für Magenresektionen, die als Notoperation bei schwerer Blutung ausgeführt wurden, betrug die Sterblichkeitsquote 36,1 Prozent; wegen Magenkrebs vorgenommene Magenresektionen hatten eine 20-prozentige Sterblichkeit; schliesst man diese bei der Zählung der gesamten Fälle aus, beträgt die Sterblichkeitsquote 4,7 Prozent.

2. Unter den 177 Überlebenden gab es 40 Kranke mit 52 postoperativen Komplikationen, was einer Morbiditätszahl von 22,5 Prozent entspricht. Die häufigsten Komplikationen waren Lungenerkrankungen, Durchsickern vom Zwölffingerdarmstump, Verstopfung des Stomas und Blutung.

3. 25 Kranke, d.h. 12,5 Prozent der gesamten Serie, hatten schon vorher chirurgische Behandlung von Geschwüren durchgemacht.

4. Die häufigste Ursache für die Operation war das Zwölffingerdarmgeschwür, wobei in 50 Fällen Blutung bestand, d.h. in 25 Prozent der Gesamtserie.

5. In 36 Fällen oder 18 Prozent der Gesamtserie war wegen schwerer Blutung eine Notoperation erforderlich.

6. Die am häufigsten ausgeführte Operation bestand in subtotaler Magenresektion mit vorderer Anastomose vom Polyatypus.

7. Die Magenresektion wurde in 15 Fällen wegen eines Krebses und in je einem Falle wegen Retikulumzellensarkoms und wegen Leiomyosarkoms ausgeführt.

8. In acht Fällen erfolgte die Magenresektion wegen schwerer Blutung aus dem oberen Magendarmkanal, ohne dass bei der Operation die blutende Stelle gefunden werden konnte. Vier von diesen Kranken erholten sich, zwei entwickelten postoperative Lungenkomplikationen, einer erlitt einen Blutungsrückfall und musste 2000 ccm Blut zugeführt, bekommen, bevor er sich erholte, und einer starb sechs Stunden nach der Operation, ohne sich von der Narkose zu erholen.

9. In 127 Fällen glaubte man während der Operation, ein Zwölffingerdarmgeschwür bestzustellen. Ein solches wurde in 48 Fällen mit einer Sterblichkeitsziffer von 8,3 Prozent entfernt, und die Morbiditätszahl unter den Überlebenden betrug 7 Prozent. In 79 Fällen wurde das Zwölffingerdarmgeschwür nicht entfernt; hier betrug die Sterblichkeitsquote 21 Prozent und die Morbiditätszahl 31 Prozent.

10. Bei den 36 wegen schwerer Blutungen Operierten betrug der Zeitraum

zwischen Krankenhausaufnahme und Operation durchschnittlich 62 Stunden in den Fällen der Überlebenden und durchschnittlich 132 Studen in den Fällen derer, die starben.

11. 146 der Patienten brauchten weniger als 2500 cc Blut; für diese betrug die Sterblichkeitsquote 5,5 Prozent. Unter den 54 Kranken, die mehr als 2500 cc Blut brauchten, wurde eine Mortalität von 28 Prozent festgestellt.

SCHLUSSFOLGERUNGEN

Auf Grund der oben zusammengefassten an den hier vorgestellten Fällen gewonnenen Statistiken kommt man zu den folgenden vier wichtigen Überlegungen:

1. Die Sterblichkeitsquote der Magenresektion ist höher, wenn diese von einem qualifizierten Allgemeinchirurgen, der sich damit nur gelegentlich beschäftigt, ausgeführt wird, als wenn ein in diesem Eingriff spezialisierter Chirurg die Operation vollzieht.
2. Die Ergebnisse dieser Krankenserie scheinen darauf hinzuweisen, dass die Morbiditäts-und Sterblichkeitsquote bei wegen Zwölffingerdarmgeschwürs ausgeführter Magenresektion sich verringert, wenn das Geschwür selbst entfernt wird.
3. Die empirisch ausgeführte subtotale Magenresektion ergibt befriedigende Resultate, auch wenn bei der Eröffnung der Bauchhöhle kein Blutungspunkt gefunden wird

Cystic Dilatation of the Common Duct

Review of the Literature and Report of a Case

EDGARD BARBOSA, M.D.,[*] AND ROBERT G. RATE, M.D.[**]

HALSTEAD, KANSAS

CYSTIC dilatation of the common duct is a rare disease. The first case in the literature was reported by Vater[1] in 1724. Clark[2] credited Told with having been the first to report a case of choledochal cyst in 1817, in the Dublin Hospital Reports (McCornel). Sakuma,[3] in Japan, reported a case in 1905.

Judd and Greene[4] of the Mayo Clinic were able to find only 1 case in a review of 17,381 operations on the biliary tract covering nineteen years. Smith,[5] at the Presbyterian Hospital in New York, encountered only 2 cysts of the choledochus in 757,000 admissions. Shallow, Eger and Wagner,[6] in a review of the literature (1943), collected 175 cases and added 1 of their own.

We were able to collect 62 additional cases from the subsequent literature, which, with the case to be reported here, raise the total to 238. Fifty of the cases described in the literature are listed in the accompanying table. Data are not available on the others.

REPORT OF CASE

P. J. H., a white girl 2½ years old, was admitted to the surgical service of the Halstead Hospital on Aug. 23, 1955. The major complaints, according to the mother, were of four weeks' duration and consisted of intermittent abdominal pain, low grade fever, and episodes of nausea and vomiting. The past and family histories were not contributory. The child appeared irritable and undernourished. On physical examination the abdomen was distended and tender. A cystic, elastic, tender mass could be palpated on the right, extending from the right costal margin to the right iliac crest. The tumor was about the size of a grapefruit and did not move with respiration. The liver was of normal size. The spleen was not palpable. There was no jaundice of the skin or sclerae. No other physical abnormalities were present.

Laboratory Data.—The red blood cell count was 4,400,000 per cubic millimeter, with 13.5 Gm., of 80 per cent, of hemoglobin. A differential count of the white blood cells revealed 4 per cent eosinophils, 1 per cent stab cells, 35 per cent segmental cells and 50 per cent lymphocytes. The value for blood urea nitrogen was 11 mg. per hundred cubic centimeters. The Kline reaction was negative, and the urine was normal.

Roentgen Data.—The chest plate revealed no abnormality. A flat plate of the abdomen showed a soft tissue mass overlying the right upper quadrant. Pyelograms were taken, showing normally functioning kidneys. The barium enema showed a normal colon; the cecum filled. The ascending and transverse portions of the colon on the right (Fig. 1) were displaced downward into the pelvis by an extracolonic mass.

Hospital Course.—On the fourth day after admission an exploratory laparotomy, excision of a congenital biliary cyst of the common duct, choledochoduodenostomy, cholecystectomy and incidental appendectomy were performed.

From the Hertzler Clinic, the Halstead Hospital and the Hertzler Research Foundation, Halstead.

[*] Resident, Surgical Service, the Hertzler Clinic, Halstead.

[**] Chief of Thoracic Surgery and of a Section in General Surgery, the Hertzler Clinic, Halstead.

Submitted for publication Jan. 30, 1956.

The choledochoduodenostomy consisted of an anastomosis between the common hepatic duct and the duodenum. The cyst in the common duct had two orifices in its upper portion, one for the cystic duct and one for the common hepatic duct, and at its lower pole one orifice was present for the lower portion of the common duct. (This type of cystic arrangement, with three orifices, two in the upper pole and one in the lower pole, is by far the most common recorded in the literature, being responsible for the disease in 65 per cent of all cases.)

The postoperative course was uneventful. The patient was up and about on the first postoperative day and was discharged on the fifth. She was seen four weeks after the operation, at which time she had already gained weight, was well and symptom-free, and again four months after the operation, at which time she was symptom-free and fully recovered.

Pathologic Report (C. A. Hellwig, M.D.).* —*Gross:* The specimen (Fig. 2) consisted of a a cystic pear-shaped mass with attached gallbladder. The size of the cyst was 17 by 10 by 6 cm. The surface was smooth and brownish red. The cyst was connected at its narrow end with the gallbladder. The length of the gallbladder was 13 mm.; the fundus had a diameter of 3 cm. The diameter of the cystic duct was 5 mm. The surface of the gallbladder was smooth and glistening. Draining from an opening in the fundus was some thin, light green mucoid bile. The cyst of the common duct contained about 300 cc. of mucoid fluid, stained light green. The lower opening in the cyst wall measured 1.5 cm. in diameter; the large opening at the upper medial portion, 3.5 cm. The wall of the cyst was between 1 and 1.5 mm. thick. Flakes of mucus were attached to the internal surface, which was partly greenish gray and partly hemorrhagic. No deep ulcers were observed. No valves could be seen in the cyst or in the cystic duct. The gallbladder contained no stones. The wall of the gallbladder was about 1 to 2 mm. thick. The folds at the internal surface were distinct and contained some deposits of yellowish material.

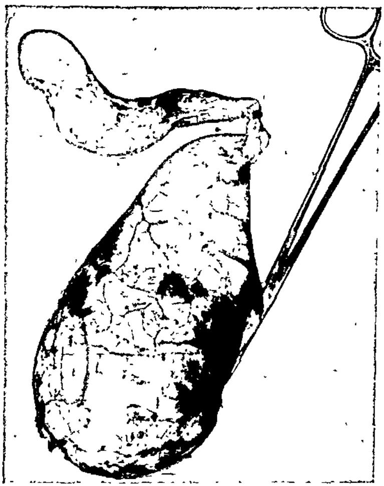


Fig. 2.—Surgical specimen, consisting of cyst of common duct, dilated cystic duct and gallbladder. Hemostat is on opening at entrance of hepatic duct into cyst.

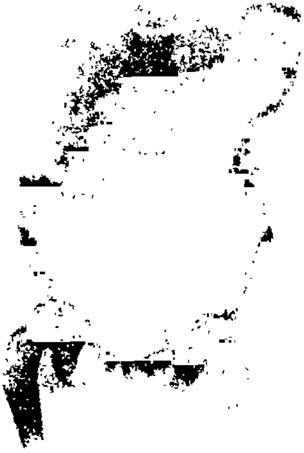


Fig. 1.—Roentgenogram taken after barium enema, showing ascending and transverse portions of colon displaced downward by cyst.

Microscopic: Section of the thicker portion of the cyst wall revealed mostly fibrous tissue. In the external layer were markedly dilated vessels, some filled [illegible] red [illegible] cells, [illegible] with albumin [illegible] no epithelial [illegible] with granular fibrinous exudate. There was extensive infiltration of the superficial layers, lymphocytes, plasma cells, some eosinophilic leukocytes and fibroblasts (Fig. 4). Near the surface was a thin layer of unstriated muscle tissue. Another area of the cyst showed a much thinner wall; also, the epithelium in this area was missing. Most of the wall consisted of dense collagenous fibers with slender, dark-stained spindle-shaped nuclei. In this area no inflammatory cells were observed in the wall. Section of the gallbladder showed well-preserved columnar epithelium lining the folds. There were few lymphocytes in the mucosa. The muscle layer was well preserved. A section from the lower part of the common duct showed slightly elevated folds covered with columnar epithelium. There were small defects in the epithelial lining. In the mucosa were several glands lined with high cuboid cells. Few lymphocytes were observed in the mucosa.

---

*Pathologist, Hertzler Clinic.

Diagnosis: Congenital choledochus cyst with chronic inflammation of the wall; dilatation of the cystic duct and the gallbladder, and stenosis of the proximal portion of the common duct, with chronic inflammation.

Pathologic Picture.—The most outstanding feature of the reported cases of choledochus cyst is the presence of an abdominal mass, usually located in the right upper quadrant. Its size has varied from that of a hen's egg to that of a man's head. The largest case on record is Reel and Burnell's case,[8] in which the contents of the cyst amounted to 8,000 cc. In Yotuyanagi's second case,[9], a 22-year-old white man had a cyst containing 5,200 cc. The disease has occurred preponderantly in the female, in a ratio of 4:1. The wall of the cyst has been definitely thickened, with small variations from one case to the next. The wall is composed of connective and fibrous tissue. The stroma usually is invaded by lymphocytes, neutrophils and plasma cells.

No epithelium has been present in the majority of cases. The contents of the cyst have varied from those in which normal bile was present to those in which the fluid was definitely infected. Stones in the cysts were observed only exceptionally (Sato,[10] McWhorter[11]).

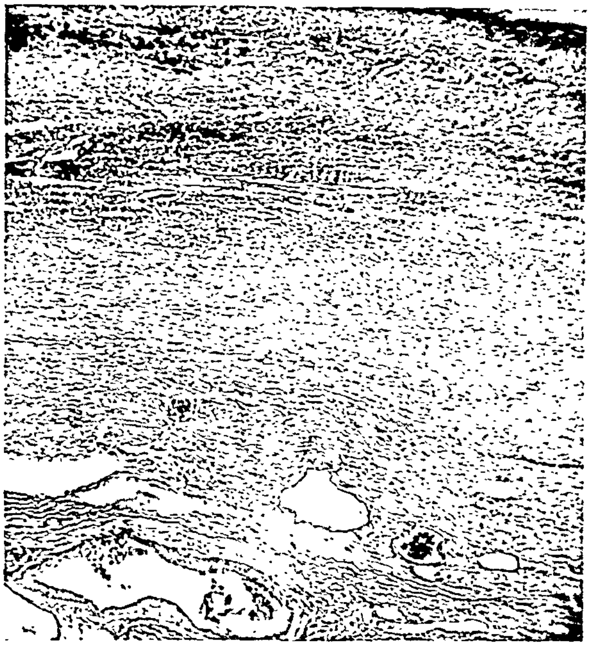


Fig. 3.—Low power photomicrograph of cyst wall shows different layers; mucosa has been destroyed and replaced by granulation tissue. Few bundles of unstriated muscle tissue and dilated blood vessels are noticed.

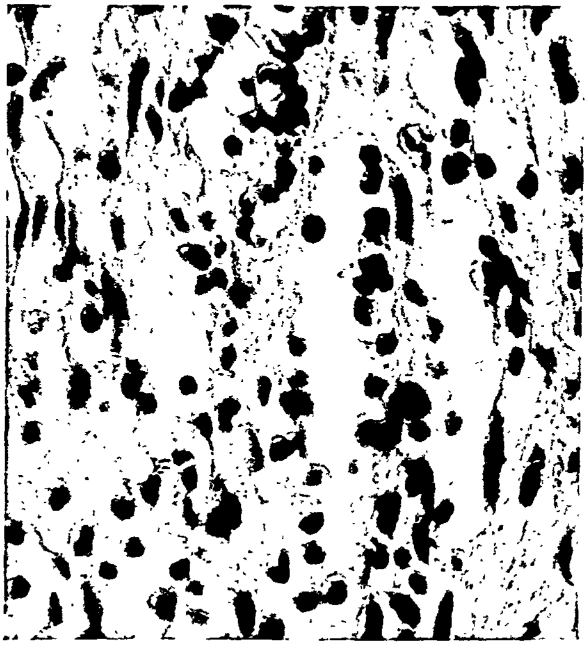


Fig. 4.—High power photomicrograph of cyst wall, showing diffuse infiltration of lymphocytes and plasma cells.

The proximal or upper portions of the ducts are usually greatly dilated, but the dilatation is cylindric and does not constitute part of the cyst. The lower end of the duct has been subject to variations; therefore, special consideration has been given to it. Hutchins and Mansdorfer[12] reported that in 17 cases a valvelike fold was observed at the outlet, with a similar fold also present over the mouth of the hepatic and cystic ducts. An abnormal course of the duct through the duodenum has been observed. In 11 cases kinks were present. In 13 cases narrowing or stenosis was seen. Some authors have interpreted the kink as secondary to cyst formation, rather than its cause. Gross[13] stated that atresia of the lower end of the duct is by no means the universal rule and mentioned Fowler's case, in which the lower portion of the common duct was greatly dilated. The cystic duct usually is greatly dilated, but as a rule the hepatic duct is not. The gallbladder may be displaced laterally but is otherwise normal. The liver is enlarged and cirrhotic in elderly patients. Ascending cholangitis is common. Associated diseases, such as cholecystitis, cholelithiasis and primary carcinoma of the liver, have been reported. Irwin and Morrison[14] reported 1 case in which malignant changes were observed in the cyst wall. In 1 case, Ripstein and Miller[15] discovered congenital atresia of the common duct coincidentally.

Etiologic Factors.—Many theories have been cited in an effort to explain the origin of congenital cystic dilatation of the common duct. Although there is general agreement that the disease is congenital and occurs predominantly in children, its origin is still obscure.

Valves, kinks, angulations, stenoses, congenital mural weakness, acholasia of the sphincter of Oddi and fibrosis have been described, but their presence is not consistent. Yotuyanagi's theory[9] of the inequality of proliferation of epithelial cells at the stage when the primitive choledochus is still solid is the most widely accepted. This inequality consists of excess proliferation of cells in the proximal portion of the duct, resulting in dilatation and in decrease of proliferation of cells in the distal portion of the duct, resulting in stenosis. When canalization takes place later on, a duct of unequal diameter results. This theory has been supported by Shallow, Eger and Wagner,[16] Rogers and Priestly,[17] Hertzler and Maguire[18] and others. In our case the interesting feature was stenosis of the lower portion of the common duct. The pancreatic duct was not involved.

Symptoms and Signs.—Abdominal tumor, jaundice and pain are the outstanding features. Fever, anorexia, nausea, vomiting and acholic stools are the secondary symptoms. According to Shallow, Eger and Wagner,[16] the tumor was present in 134, or 77 per cent, of their series of 175 cases. Jaundice was present in 122 instances, or 70 per cent. Jaundice depends on the degree of obstruction of the bile ducts. Pain was present in 103, or 59 per cent, of the patients and is explained by the increase of pressure within the bile ducts. In the cases reviewed from the literature, abdominal tumor was present in 34 patients, or 68 per cent. Pain was present in 32 patients, or 64 per cent, and jaundice in 31 patients, or 62 per cent.

Vomiting may be the consequence of partial duodenal ileus caused by pressure of the cyst on the root of the mesentery. Fever is of the low grade type and is the result of cholangitis, hepatitis, or both, and of primary infection of the cyst wall. Ascites has been reported in a few instances and is due to compression of the portal vein by the cyst. The urine may show albumin and casts. The chief roentgen signs are detected in the cholecystograms and the gastrointestinal series. The gallbladder does not concentrate the dye and is not visualized. In the gastrointestinal series the stomach is displaced medially and anteriorly. The hepatic flexure, the transverse colon and the jejunum may be displaced downward.

Differential Diagnosis. — Cystic dilatation of the common duct is a congenital lesion in which there is a tremendous enlargement of the lower part of the extrabiliary passages. The disease occurs predominantly in children; in 29, or 58 per cent, of the cases reviewed the patients were children. Diagnosis of congenital choledochus cyst has been made preoperatively in only a few instances. In Shallow, Eger and Wagner's 175 cases,[16] the diagnosis was correctly made in 15 cases, or 8.6 per cent. The pathologic entities requiring differential diagnosis are cysts of the liver (congenital and infectious); cholelithiasis; abdominal neoplasm; congenital atresia of the bile duct; cyst of the pancreas, mesentery and ovary, and diverticula of the duodenum and colon.

In the presence of echinococcus cyst of the liver the abdominal tumor is connected with the liver; therefore, the palpable mass is in the liver. An echinococcus cyst may be either stationary or progressively increasing in size, but the choledochus cyst tends to vary in this respect, especially after the ingestion of food. The choledochus cyst is tender and does not move with respiration, whereas the echinococcus cyst moves with respiration and as a rule does not produce pain. The geographic distribution of echinococciasis is a point to be remembered in the differential diagnosis. Echinococciasis is endemic in Europe, the Near East, the United States of Soviet Russia, China, Japan, South Africa and the north coast of Africa. It is endemic also in Argentina and Uruguay. In the United States, endemic areas exist in the South, the Middle West, the mountain states and California. Finally, the complement fixation test, Casoni's reaction, should rule out echinococcus disease. Eosinophilia is usually present. Cholecystolithiasis and choledocholithiasis are seldom observed in children. A flat plate of the abdomen, however, should be sufficient for differential diagnosis.

In the presence of abdominal neoplasm the course is rapid and fatal, but a choledochus cyst is benign and the general picture remains the same. Pyelograms are of great help, providing the diagnostician with a valuable tool in the differential diagnosis of Wilms' tumor and cyst of the choledochus. In our case the child was not jaundiced. Wilms' tumor was readily ruled out by retrograde pyelographic study.

In cases of congenital atresia of the bile duct the age of the patient has maximum importance, for this anomaly is usually observed in children 1 to several months old. Only 16 per cent of the patients with cysts of the choledochus have had symptoms before they were 6 months old. Congenital cysts of the liver are as a rule observed in adults. Pancreatic cysts may cause pressure on the common duct, complicating the differential diagnosis. The serum amylase level may be helpful, and, according to Elman,[19] this level may be elevated in the presence of pancreatic cysts. Mesenteric and ovarian cysts should be ruled out before the diagnosis of choledochus cyst is considered.

Treatment.—Treatment of cystic dilatation of the common duct is directed toward reestablishment of a free flow of bile into the gastrointestinal tract. In the past, several surgical procedures have been used for such purposes.

Marsupialization of the cyst has been performed when the patient was acutely ill and drainage imperative. It is a temporary measure and has been accompanied by a high mortality rate. It was performed as a first-stage procedure in 3, or 6 per cent, of the cases studied. In these 3 instances the patients were acutely ill. Anastomosis between the cyst and the duo-

Choledochal Cyst: Data on Fifty Cases

Case; Year Published	Age; Race; Sex	Classic Triad: Mass Abdominal	Classic Triad: Abdominal Pain	Classic Triad: Jaundice	Operation	Complications	Follow-up
1,[5] 1942	20 yr. W F	+	+	+	(1) Marsupialization of cyst; (2) choledochocystoduodenostomy	None	Symptom-free 11 months after operation
2,[5] 1942	28 yr. W F	+	+	+	(1) Excision of cyst; (2) cholecystoenterostomy to correct biliary fistula	(1) Hemorrhage from cyst side, controlled by packing, transfusion, etc.; (2) biliary fistula after first operation	Died 10 days after last surgical procedure—fat necrosis of pancreas, acute pancreatitis
3,[23] 1943	22 yr. W F	+	+	+	(1) Appendectomy; (2) cholecystectomy; (3) choledochocystoduodenostomy	Liver abscess	Died one year later of generalized peritonitis after rupture of liver abscess
4,[12] 1944	18 months Negro M	+	—	—	(1) Choledochocystoduodenostomy; (2) cholecystostomy	(1) Pneumonia 7 days after operation; (2) jaundice and gallbladder stones 9 months later	Recovered, but gallstones developed in gallbladder
5,[24] 1944	29 yr. W F	+	—	—	Postmortem data		
6,[14] 1944	30 yr. W F		+	+	Cystostomy plus anastomosis between gallbladder and stomach	Hemorrhagic shock 24 hours after operation	Squamous cell carcinoma and stones within cyst; died
7,[25] 1946	17 yr. W F	+	+	+	Postmortem data		
8,[5] 1946	58 yr. W F	+	+	+	Choledochocystoduodenostomy	None	Recovered
9,[26] 1946	17 yr. W F	+	+	+	(1) Incisional drainage; (2) partial excision of cyst, anastomosis between gallbladder and upper end of common duct; (3) anastomosis between gallbladder and duodenum	Pulmonary embolism	Died 18 days after operation
10,[27] 1946	22 yr. Negro M	+	+	—	Choledochocystoduodenostomy	None	Recovered
11,[28] 1946	25 yr. W F	+	+		Primary excision of cyst plus anastomosis and choledochoduodenostomy	None	Recovered
12,[29] 1947	14 yr.	+	+		Choledochorrhaphy (Matta's technic)	None	Recovered
13,[30] 1947	29 yr. W F	+	+	—	Choledochocystoduodenostomy	None	Symptom-free [illegible] aft

Choledochal Cyst: Data on Fifty Cases—Continued

Case: Year Published	*Age: Race; Sex*	*Classic Triad:*			*Operation*	*Complications*	*Follow-up*
		Mass Abdominal	*Abdominal Pain*	*Jaundice*			
14,[31] 1947	4 yr. W F			+	Choledochocystoduodenostomy	None	Recovered
15,[32] 1948	5 yr. W M	+	+	+	Choledochocystoduodenostomy	Cholangitis 6 weeks after operation	Well 4 months after operation
16,[20] 1948	30 yr. W M		+	+	(1) Roux en Y anastomosis of cyst and jejunum; (2) removal of 6 stones from cyst	(1) Pneumonia p.o.; (2) gastrointestinal bleeding 18 & 19 p.o. days from low prothrombin; (3) thrombophlebitis R. leg 29 p.o. day	Symptom-free 11 months after operation
17,[15] 1948	4 months W F			+	Excision of cyst		Died 2 weeks after operation
18,[17] 1949	62 yr. W F	+	+	—	Roux en Y anastomosis of cyst and jejunum	Acute auricular fibrillation	Died 1 year later
19,[33] 1949	4 days W	+	—	—	(1) Cystostomy and gastrostomy; (2) cystogastrostomy	None	Well 18 months after operation
20,[34] 1949	52 yr. W M	+	+		(1) Partial resection of cyst; (2) choledochojejunostomy; (3) gastrojejunal anastomosis	None	Recovered
21,[20] 1950	17 yr. W F	+	+	+	(1) Choledochocystojejunostomy; (2) Roux en Y anastomosis	None	Symptom-free 4 months after operation
22,[35] 1950	3 months W F			+	Cholecystogastrostomy	None	Recovered
23,[36] 1950	15 yr. W F	—	+	+	Partial excision of cyst and reconstruction of common duct		None given
24,[37] 1950	37 yr. W F	+	+	+	Choledochocystoduodenostomy	None	Symptom-free 18 months after operation
25,[38] 1950	3 months W	—	—	+	Choledochocystogastrostomy	Volvulus of stomach	Died 4 days after operation
26,[39] 1950	4 months W F	+		+	Anastomosis between cyst and duodenum	None	Well 13 months after operation
27,[18] 1951	5 yr. W F	+	+		(1) Marsupialization of cyst; (2) choledochocystoduodenostomy	Cholangitis	Several episodes of pain, nausea, vomiting and fever 3½ years after operation
28,[18] 1951	1 yr. W	+			Excision of cyst plus hepatocholedochoduodenostomy	None	Well 12 months after operation

Choledochal Cyst: Data on Fifty Cases—Continued

		Classic Triad:					
Case; Year Published	*Age; Race; Sex*	*Abdominal Mass*	*Abdominal Pain*	*Jaundice*	*Operation*	*Complications*	*Follow-up*
29,[40] 1951	17 yr. Negro F	+	+	—	Autopsy. Choledochus cyst 20 × 11 cm. contained 3,500 cc. bile	Patient 34 weeks pregnant; died in shock after spontaneous delivery of macerated fetus	Autopsy
30,[22] 1951	24 yr. W F		+	+	Roux en Y anastomosis between cyst and jejunum	None	Symptom-free 2 years after operation
31,[41] 1951	18 months Negro F	+	—	—	Choledochocystoduodenostomy	Cholangitis for 2 weeks after operation	Recovered
32,[42] 1951	28 yr. W M		+		(1) Excision of cyst; (2) choledochojejunostomy; (3) enteroanastomosis between loops of jejunum	None	Symptom-free 1 year after operation
33,[43] 1952	2 months W F			+	Choledochocystoduodenostomy	None	Symptom-free 6 months after operation
34,[44] 1952	12 yr. W F	+	+	+	(1) Anastomosis between cyst and pyloric end of stomach; (2) gastrojejunostomy	Pyloric obstruction 24 hours after operation	Symptom-free 2 years after operation
35,[45] 1953	9 yr. Negro F	+	+	+	Choledochojejunostomy Roux en Y anastomosis		None given
36,[46] 1953	5 weeks W M	+	—	—	Choledochocystoduodenostomy	None	Symptom-free 1 year after operation
37,[47] 1953	14 yr. Japanese M	+	+	+	Choledochocystoduodenostomy	Cholangitis 2 years after operation	Recovered
38,[48] 1953	11 yr. W	+	+	+	Choledochocystoduodenostomy	Obstruction of anastomosis, surgically corrected	Recovered
39,[48] 1953	34 yr. W F		+	+	Choledochocystoduodenostomy	Cholangitis 8 months after operation	Recovered
40,[48] 1953	20 yr. W F		+	+	Cholecystectomy and choledochostomy (T-tube drainage)	None	Recovered
41,[48] 1953	59 yr. W F		+	+	(1) Choledochoduodenostomy; (2) gastroenteroanastomosis	Cholangitis 13 months after operation	Recovered
42,[48] 1953	48 yr. W		+	+	drainage of cyst	On admission pancreatitis which subsided after operation	Recovered
43,[47] 1954	4 yr. W F	+		+	Choledochoduodenostomy	None	Symptom-free 1 year after operation

Choledochal Cyst: Data on Fifty Cases—Continued

Case; Year Published	Age; Race; Sex	Classic Triad: Mass Abdominal	Abdominal Pain	Jaundice	Operation	Complications	Follow-up
44,[49] 1954	4 months W F			+	Choledochoduodenostomy	None	Symptom-free 6 weeks after operation
45,[50] 1954	5 yr. W M	+			Partial excision of cyst	None	Symptom-free 5 months after operation
46,[51] 1955	18 yr. W F	+		+	Roux en Y anastomosis of cyst to jejunum	None	Symptom-free 2½ years after operation
47,[51] 1955	14 yr. W F	+		+	(1) Marsupialization; (2) Roux en Y anastomosis	None	Symptom-free 2 months after operation
48,[52] 1955	2 yr. W F	+			Choledochocystoduodenostomy	None	Recovered
49,[52] 1955	10 yr. W M	+	+	+	Roux en Y anastomosis of cyst to jejunum	None	Recovered
50*	2 yr.	+	+		Excision of cyst and hepatodochoduodenostomy	None	Recovered

*Barbosa and Rate (reported in this paper).

denum or the stomach is a sound operation. It should be borne in mind that the development of cholangitis and hepatitis, primarily due to regurgitation of the intestinal contents into the biliary tree, may produce discomforting symptoms. This applies particularly between the stomach and the biliary tract. In the cases reviewed by us, formed in 16 cases, or 32 per cent, and was followed by complications in 7, or 14 per cent; in 5 patients, or 10 per cent, cholangitis developed postoperatively. In 1 patient volvulus of the stomach developed, and in another, gastrointestinal obstruction. The Roux en Y anastomosis has been accompanied by good results. Keeley,[20] Archambault,[21] Strohl and Sarver,[22] Rogers and Priestly[16] and others have reported cases successfully treated by this procedure. The incidence of sequellae after this operation is reported to be low. Excision of the cyst with primary anastomosis of the common hepatic duct to the duodenum is the procedure of choice in appropriately selected cases. It has the lowest mortality rate, provides a new biliary tract and removes the cyst which is infected and may contain further pathology. Our main criticism of the surgical procedures where the cyst is not removed is that besides infection, stones or malignancy may be overlooked. Irwin and Morrison[14] in 1944 reported a case in which the cyst had undergone malignant change.

Puncture aspiration of the cyst should be avoided as it may lead to fatal bile peritonitis; 7, or 14 per cent, of the patients studied by us died after this operation. Cirrhosis of the liver, pancreatitis, cholangitis, hemorrhage, peritonitis, pulmonary embolism and auricular fibrillation have been the other causes of death in patients surgically treated.

SUMMARY

1. Congenital cystic dilatation of the common duct is a rare disease that occurs principally in children.

2. The case of a 2½-year-old white girl is reported, in which the principal manifestations were a palpable mass and pain in the right upper abdominal quadrant.

3. In the authors' opinion, primary excision of the cyst and hepatodochoduodenostomy are the treatment of choice.

ZUSAMMENFASSUNG

1. Die angeborene zystische Erweiterung des Choledochus ist eine seltene Erkrankung, die hauptsächlich bei Kindern vorkommt.

2. Es wird über den Fall eines zweieinhalbjährigen Mädchens der weissen Rasse berichtet, bei dem die wesentlichen Krankheitserscheinungen in einer fühlbaren Geschwulst und Schmerzen in der rechten oberen Bauchecke bestanden.

3. Der Verfasser hält die primäre Resektion der Zyste und eine Anastomosiehung der Gallengänge mit dem Zwölffingerdarm für die Behandlung der Wahl.

RIASSUNTO

1. Le dilatazioni cistiche congenite del coledoco sono affezioni rare che si verificano per solito nei bambini.

2. Viene riferito il caso di una bambina di 2 anni e mezzo di razza bianca in cui la manifestazione principale era rappresentata da una massa dolente all'ipocondrio destro.

3. La cura di scelta è rappresentata dalla asportazione della cisti seguita da epatoduodenostomia.

RÉSUMÉ

1. La dilatation kystique congénitale du choledoque est une maladie rare, qu'on trouve principalément chez les enfants.

2. Le cas d'une fille de race blanche, agée de 2ans et demi, est reporté, ou les manifestations principales étaient un tumeur palpable et des douleurs du quadrant supérieur abdominal du coté droit.

3. Dans l'opinion de l'auteur l'excision primaire de la kyste et une hépatodochoduodenostomie sont les traitements de choix.

REFERENCES

1. Lichtman, S. S.: Choledochus Cyst in Diseases of the Liver, Gallbladder and Bile Ducts. Philadelphia: Lea & Febiger, 1953, vol. 2, p. 1245.

2. Clark, J. H.: So-called Idiopathic Cyst; Pathogenesis and Pathology: Report of a Case with Review of the Literature, Internat. Clin. 1: 78-103, 1932.

3. Sakuma: Cited by Yotuyanagi, S.: Contribution to the Etiology and Pathology of Idiopathic Cystic Dilatation of the Common Bile Duct, Gann 30:601-650, 1936.

4. Judd, E. S., and Greene, E. L.: Choledochus Cyst, Surg., Gynec. & Obst. 46:417, 1928.

5. Smith, B. C.: Cyst of the Common Duct, Arch. Surg. 44:963, 1942.

6. Shallow, A. T.; Eger, E. S., and Wagner, F. B. Jr.: Congenital Cystic Dilatation of the Common Duct, Ann. Surg. 123:119-126, 1946.

7. (a) Atumi, T.: A Case of Idiopathic Choledochus Cyst, Hirosaki M. J. 2:197-198, 1951. (b) Bernheim, M.; Marion, P.; Roux, J. A.; Lanternier, J., and Bethenod, M.: Congenital Cyst of the Common Bile Duct in an Infant: Case Report, Pediatrics 8:677-683, 1953. (c) Bodart, A.; Neimann, N.; Lesure, J., and Pierson, M.: Giant Cyst of the Common Bile Duct, Rev. Med. Nancy 78: 368-376, 1953. (d) Caussade, I.; Bodart, A.; Neimann, N.; Lesure, J., and Pierson, M.: Idiopathic Cyst of the Common Duct, Rev. Med. Nancy 79: 131-134, 1954. (e) Diebold, O. W.: Congenital Cystic Dilatation (Idiopathic Choledochal Cysts), Deutsche Ztschr. f. Chir. 256:566, 1942. Gray, W.: Congenital Diverticulum of the Common Bile Duct, Brit. M. J. 2:366-367, 1942. (g) Hatano, S., and Imoto, M.: Case Report of a Congenital Cystic Dilatation of the Common Bile Duct, J. A. Nagasaki Igakkai Zassi 29:307-312, 1954. (h) Horansky, V.: Choledochal Cyst Simulating Banti's Syndrome, Cesk, Pediat. 10:134-137, 1955. (i) Kazar, G. K.: Double Gallbladder and Cyst of the Common Bile Duct, Magyar Sebeszet 3:298-301, 1950. (j) Nitsche, E.: Choledochus Cyst: Case, Deutsche. Ztschr. f. Chir. 255:650, 1942. (k) Tortorici, [illegible] for Idiopathic Dilata[illegible]uct, Arch. ital. Chir. [illegible] J. O.: A Case of Congenital Cyst of the Common Bile Duct, Casop. lek. cesk. 92:523-526, 1953.

8. Reel, J. B., and Burrell, N. E.: Cystic Dilatation of the Common Bile Duct, Ann. Surg. 75: 191, 1922.

9. Yotuyanagi, S.: Contribution to the Etiology and Pathology of Idiopathic Cystic Dilatation of the Common Bile Duct, Gann 30:601-650, 1936.

10. Sato: Cited by Yotuyanagi.[9]

11. McWhorter, G. L.: Congenital Cystic Dilatation of the Bile and Pancreatic Ducts, Arch. Surg. 38:397-411, 1939.

12. Hutchins, E. H., and Mansdorfer, B. G.: Congenital Cystic Dilatation of the Common Bile Duct with Sequellae, J.A.M.A. 125:202-204, 1944.

13. Gross, R. E.: The Surgery of Infancy and Childhood. Philadelphia: The W. B. Saunders Company, 1953, pp. 524-530.

14. Irwin, S. T., and Morrison, J. E.: Congenital Cyst of the Common Bile Duct Containing Stones and Undergoing Cancerous Change, Brit. J. Surg. 32:319-321, 1944.

15. Ripstein, C. B., and Miller, G. G.: Choledochus Cyst Associated with Congenital Atresia of the Bile Ducts, Ann. Surg. 128:1173-1177, 1948.

16. Shallow, A. T.; Eger, E. S., and Wagner, F. B. Jr.: Congenital Cystic Dilatation of the Common Bile Duct: Case Report and Review of the Literature, Ann. Surg. 117:355-386, 1943.

17. Rogers, J. D., and Priestley, J. T.: Cystic Dilatation of the Common Bile Duct: Report of a Case, Proc. Staff Meet. Mayo Clinic 24:568-575, 1949.

18. Hertzler, J. H., and Maguire, E. C.: Congenital Dilatation of the Common Bile Duct: Report of Two Cases in Children, Arch. Surg. 62: 275-283, 1951.

19. Elman, R.: Blood Amylase in Relation to Diseases of the Pancreas, Arch. Int. Med. 48:828, 1931.

20. Keeley, J. L.: Congenital Cystic Dilatation of the Common Bile Duct: Report of a Case, Arch. Surg. 56:508-515, 1948.

21. Archambault, H.; Archambault, R., and Lasker, W. G.: Choledochus Cyst, Ann. Surg. 132: 1145-1158, 1950.

22. Strohl, E. L., and Sarver, F. E.: Cystic Dilatation of the Common Bile Duct, Arch. Surg. 62: 597-600, 1951.

23. Swartley, W. B.: Choledochus Cyst: Report of Two Cases, Ann. Surg. 118:91-100, 1943.

24. Chesterman, J. T.: Choledochus Cyst Complicating Pregnancy and Puerperium, J. Obst. & Gynaec. British Empire 51:512, 1944.

25. Armanino, L. P.: Idiopathic Dilatation of the Common Bile Duct with Coexistent Primary Hepatic Carcinoma: Report of a Case, Ann. Int. Med. 24:714-726, 1946.

26. Blegen, H. M., and Boyer, E. L.: Perforation of Choledochus Cyst with Biliary Peritonitis: Report of a Case Submitted to Three-State Operations, Journal-Lancet 66:177, 1946.

27. McLaughlin, E. F.: Choledochus Cyst, Ann. Surg. 123:1047-1062, 1946.

28. Stajano, C.: Congenital Dilatation of the Hepatic Duct and Main Duct (Megacholedochus), Bol. Soc. cir. Uruguay 17:261, 1946.

29. Gartner, E.: Case of Cystic Dilatation of the Choledochus, J.A.M.A. 134:1196, 1947.

30. Fleming, R. J.: Cyst of the Common Bile Duct in a Case of Pregnancy of Eight Months, South African M. J. 21:778-782, 1947.

31. Kelsey, M. W.: Idiopathic Dilatation of the Common Bile Duct, J. Pediat. 31:211-212, 1947.

32. Davis, C. E. Jr.: Choledochus Cyst, Ann. Surg. 128:240-246, 1948.

33. Brummelkamp, R., and Verboom, C. H.: Congenital Cyst of the Common Bile Duct in a Newborn Infant, Arch. chir. Neerland. 1:113-120, 1949.

34. Cachin, M. L.: Congenital Cystic Dilatation of the Common Bile Duct, Paris Med. 39: 219-222, 1949.

35. Carter, R. F., and Saypol, G. M.: Symposium: Surgery for Jaundice in Infants and Children, New York State J. Med. 50:2945-2947, 1950.

36. Gale, J. W., and Peterson, M. G.: Cystic Dilatation of the Ductus Choledochus, Wisconsin M. J. 49:1108-1110, 1950.

37. Goldman, William P., and Zack, J. J.: Choledochus Cyst, Canadian M. A. J. 68:162-164, 1952.

38. Simon, M.: Congenital Dilatation of the Common Bile Duct, Mem. Acad. chir. 76:450-453, 1950.

39. Gilliland, M. B.; Holloway, C. E., and Lauge, J. H.: Congenital Choledochus Cyst: Review of the Literature and Case Report, J. Pediat. 37: 387-392, 1950.

40. MacPherson, C. R.: Congenital Cystic Dilatation of the Common Bile Duct Associated with Accessory Hepatic Ducts, South African M. J. 25:965-967, 1951.

41. White, R. J.: Congenital Lesions of the Alimentary Tract in Children, Texas State J. Med. 47:742, 1951.

42. Sullivan, L. X., and Dmytryk, E. T.: Choledochus Cyst, Case Report, J. Missouri M. A. 48: 135-136, 1951.

43. Dickenson, E. H., and Spencer, F. C.: Choledochal Cyst, J. Pediat. 41:462-466, 1952.

44. Newsom, A. L. B.: Congenital Cystic Dilatation of the Common Duct, M. J. Australia 1: 784-785, 1952.

45. Louw, J. H.: Abdominal Swellings in Childhood, South African M. J. 27:1021-1026, 1953.

46. Wrightson, P.: Congenital Cystic Dilatation of the Common Bile Duct, Australian & New Zealand J. Surg. 23:110-115, 1953.

47. Burgess, C. M., and Cherry, J. W.: Idiopathic Dilatation of the Common Duct, Arch. Surg. 67:771-775, 1953.

48. Caroli, J., and Marcoulides, G.: Study of the Pathology of Congenital Dilatation of the Common Bile Duct, Arch. mal app. digest. Par. 42:1045-1060, 1953.

49. Sulamaa, M.: Surgical Treatment of Congenital Anomalies of the Bile Ducts, Acta. chir. scand. 106:95, 1953.

50. Dennison, W. M.: Choledochus Cyst in Childhood, J. Internat. Coll. Surg. 21:113-117, 1954.

51. Attar, S., and Obeid, S.: Congenital Cyst of the Common Bile Duct, Ann. Surg. 142:289-295, 1955.

52. Shocket, E.; Hallenbeck, G. A., and Hayles, A. B.: Choledochal Cysts, Proc. Staff Meet. Mayo Clinic 30:83-89, 1955.

ADDITIONAL SOURCES

Blocker, T. J. Jr.; Williams, H., and Williams, J. E.: Traumatic Rupture of a Congenital Cyst of the Choledochus, Arch. Surg. 34:695-701, 1937.

Gross, R. E.: Idiopathic Dilatation of the Common Bile Duct in Children: Review of the Literature and Report of Two Cases, J. Pediat. 3:730-755, 1933.

Kong, G. T.: A Perforated Idiopathic Cyst of the Common Bile Duct with Clonorchis in the Cyst Contents, Chirurg. 22:56-57, 1951.

Vogogna, E., and Larree, H.: Congenital Dilatation of the Common Bile Duct (Megacholedochus), Acad. argent. Cirurg. Santa Fe 34:518-524, 1950.

◆

The mere denunciation of war as a crime is no deterrent if it appears that the other fellow is about to commit the crime. It is just as likely as not to make the war seem twice as righteous, and hence to make it twice as fierce, because it can be said that the enemy is committing a crime and is an outlaw. The late war demonstrated what excellent war propaganda can be made out of the ordinary pacifist teaching. For that teaching has this fundamental defect: it supposes that nations on the eve of war are like murderers who are trying to decide whether they will kill their enemies, and that they will decide not to kill if only the heinousness of the crime has been sufficiently impressed upon them. But this is a wholly false supposition: nations on the eve of war almost invariably feel that they are innocent *householders who are about to be attacked by robbers, or that they are witnesses* of some dastardly outrage which is about to be perpetrated against their neighbors. The choice as it presents itself is not between the crime of war and the righteousness of peace, but between ruin and disgrace on the one hand, and self-preservation, courage, and honor on the other.

This may not be the real choice. As we know, nations may be cruelly deceived as to what the war is about. But this deception is part of the institution of war, and we fail to get at the inwardness of war unless we realize that events which lead *to war produce a situation in which war seems less horrible than any feasible alternative.* Of course, if nations knew as much on the eve of war as historians know fifty years after, they might feel quite differently. Everything would be different. Their statesmen would act differently. Their people would respond differently. But the fact is that, as the world is now organized, the situation which breeds a war first breeds a state of mind which makes that particular war seem righteous and inevitable. And nothing is done to alter this situation by saying that war is horrible. It is very horrible. But under certain circumstances, which are the only circumstances worth talking about, it seems less horrible to those who have to make the decision than does any other course of action which is open to them.

—*Lippmann*

The Encysted Gallstone: Technic for Cholecystectomy

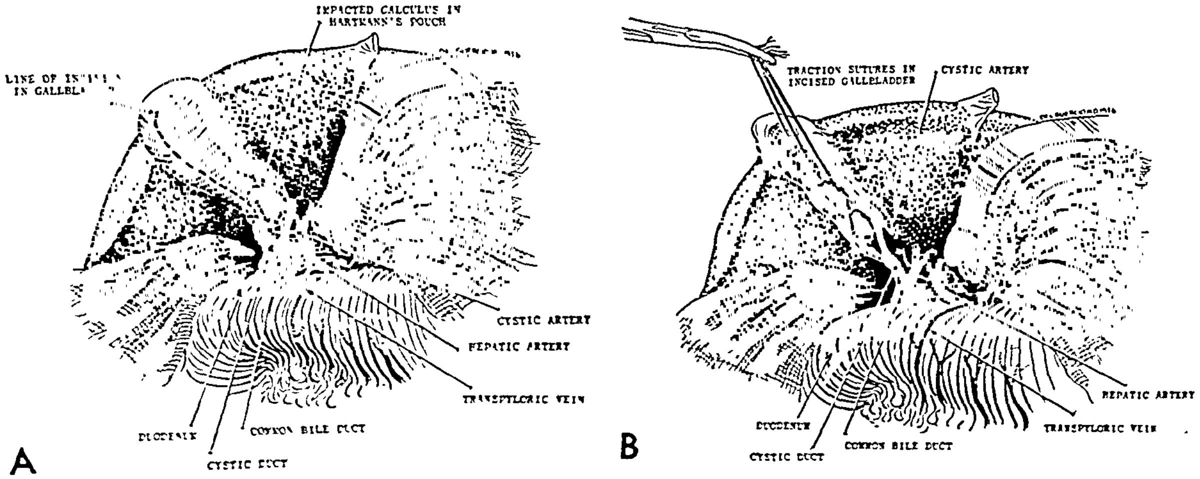
THOMAS C. CASE, M.D., F.A.C.S., F.I.C.S.
NEW YORK CITY, NEW YORK

ONE may be rather reluctant to accept changes in any technic that is apparently satisfactory, relatively easy and in common usage. Convenience, habit and training are responsible for this attitude.

While surgery of the biliary system has had a gradual and ordered evolution, it is disquieting to learn of the number of patients who, in the course of cholecystic operations, have suffered injuries to the ducts resulting in disability or death.

Injury of the bile ducts under ordinary conditions is usually due to the poor execution of a surgical procedure on or about these structures. In the presence of acute inflammation the presence of abnormal arrangements of the involved structures increases the danger of injury. The increasing incidence of complications and serious sequelae from operation on the gallbladder warrants emphasis on the acute awareness of anatomic variations, for this is essential to the avoidance of inaccurate and sometimes dangerous technics.

Skillful technic requires four fundamental conditions: (1) accurate knowledge of the anatomy of the field of operation and its variations; (2) adequate exposure of the operative region; (3) comfortable operating conditions, and (4) competent anesthesia. Lack of any of these will result in impairment of the technical quality of the operation. This holds true particularly for operations on the gallbladder, which can be a taxing enterprise even for the most experienced surgeon. Any suggestion that may facilitate



A, schematic drawing of gallbladder with encysted calculus in Hartmann's pouch. Dotted line represents line of incision in gallbladder. *B*, incised and emptied gallbladder with traction sutures in place. Traction is exerted on the individual sutures.

Submitted for publication Jan. 16, 1956.

the technic is worthy of consideration. Prudence dictates that the good results anticipated from individualization in each case be weighed against the possible undesirable effects of attempting the routine cholecystectomy.

Although the technic here to be suggested can be applied in all cases, I refer particularly to the cases of acute cholecystic disease and to the thickened, chronically diseased gallbladder with encysted stone or stones, particularly those involving the Hartmann pouch and causing occlusion of the cystic duct.

In cases of solitary stone, whether encysted or not, surgical intervention is indicated early, for two reasons: 1. The presence of the calculus is definite evidence of pathologic change in the organ and can present the same signs and symptoms and cause the same complications as do multiple stones. 2. Obstruction of the cystic duct can cause repeated episodes of inflammation. When the inflammation becomes sufficiently severe, sound therapy must be instituted if one is to prevent serious operative complications or gangrene and perforation of the gallbladder.

The importance of early surgical intervention for acute cholecystic disease has been stressed by many surgeons and accepted by most clinics. Other surgeons intervene only after all acute manifestations have subsided. The divergence of opinion is concerned primarily with the definition of the time limit for "early" intervention. The method of operative procedure has also been subject to debate, for many reasons. One of these is based on the technical difficulties that may be encountered in the removal of a difficult gallbladder and the serious complications that may arise from faulty technic. This applies particularly to the encysted solitary gallstone. The distortion of the normal anatomic picture in the presence of inflammatory edema and the involvement of vital structures makes operation most dangerous. For many years I have seen hazardous maneuvers performed and clamps applied to the gallbladder for traction in such cases. I therefore offer my own technic for consideration.

Technic.—After the abdomen has been opened, the structures surrounding the gallbladder region are methodically packed away. Pericholecystic adhesions, if present, are dissected off the gallbladder, and its fundus is gently grasped with an Allis clamp. After aspiration of the liquid contents of the gallbladder with a trocar, the gallbladder is incised along its inferior surface, low enough to insure complete evacuation of its contents and all calculi. The gallbladder cavity is then loosely packed with a piece of gauze, and the edges of the wound are approximated with three very long, evenly distributed sutures along the line of incision. The sutures include the gallbladder wall and the gauze within it, and they act both as hemostatic sutures and as tractors for the cholecystectomy to follow. The traction is to be applied completely outside the field of operation, and this can be done only if the sutures are very long. The gauze pack in the gallbladder serves several purposes: 1. It helps to control bleeding in the gallbladder. 2. It prevents spillage of bile. 3. It lends body to the emptied gallbladder and provides a good hold for the traction sutures, particularly when the dissection is carried down and about the common duct.

Many surgeons are aware of the difficulties presented by the application of clamps for traction on the thickened or acutely inflamed gallbladder. The application of long traction sutures that will hold and the omission of clamp traction and interfering hands in the operative field may make an otherwise difficult and hazardous procedure relatively simple and s

SUMMARY

A suggestion is offered for cholecystectomy with long traction sutures, by means of which the exposure and removal of a difficult gallbladder is facilitated. The hazards of injury to the surrounding vital structures are reduced because the operation can be performed under clear vision.

RÉSUMÉ

On offre une recommandation de la cholécystectomie avec des longues sutures de traction, pour faciliter l'exposition et l'excision de la vésicule biliaire. Les accidents d'une lésion des structures vitales entourantes sont reduits, parce que l'opération est executée à vision claire.

ZUSAMMENFASSUNG

Es wird der Vorschlag gemacht, bei der Gallenblasenresektion lange Zugnähte zu verwenden, mit deren Hilfe sich eine schwierige Gallenblase leichter freilegen und entfernen lässt. Da die Operation sich mit klarer Übersicht vollziehen lässt, verringert sich das Risiko der Verletzung lebenswichtiger Gebilde in der Umgebung der Gallenblase.

RIASSUNTO

Viene suggerito un metodo, di colecistectomia in cui si usano lunghi fili di trazione che consentono la esposizione e la rimozione di una cistiffellea difficile. I pericoli di lesione alle strutture circostanti sono molto ridotti poichè l'operazione si eseguisce con ampia visibilità.

◆

There is a principle which is a bar against all information, which is proof against all argument and which cannot fail to keep a man in everlasting ignorance. This principle is contempt prior to examination.

—*Spencer*

Every day increases the sheer weight of knowledge put into our hands, some new power control over natural processes. . . . Our age is being forcibly reminded that knowledge is no substitute for wisdom. Far and away the most important thing in human life is living it.

—*Garry*

Fatal Massive Gastrointestinal Hemorrhage Due to Multiple Phlebectasia of the Small Intestine

Report of a Case

S. L. SHANDALOW, M.D., F.I.C.S.
BROOKLYN, NEW YORK

MASSIVE gastrointestinal hemorrhage in the aged poses a major diagnostic and therapeutic surgical problem. And, as the proportion of elderly patients steadily increases, so does the frequency with which surgeons are and will be faced with this problem.

In elderly and old persons, uncontrollable bleeding from the upper part of the gastrointestinal tract can usually be ascribed to a nonretractable atherosclerotic artery occupying the center of an ulcer crater in the stomach (benign or malignant) or in the duodenum (commonly benign). Eroded esophageal varices, secondary to portal hypertension from any cause, are a less frequent possibility.

The comparatively rare bleeding tumors of the stomach and small bowel (adenomas, myomas, hemangiomas, neurofibromas, fibromas, etc.) are, undeniably, unimportant factors in the differential diagnosis —with one major exception. When there have been no symptom-producing gastrointestinal disturbances preceding the hemorrhage and only meager signs are observed on physical examination, the likelihood of the presence of one of these infrequent conditions of the small intestine becomes immeasurably greater. The validity of this statement is borne out by the case about to be described.

REPORT OF CASE

E. B., a white man aged 83, a former carpetlayer, had a history of basal cell carcinoma of the right side of the nose, successfully treated with radium packs more than twenty years earlier. He stated that for two weeks prior to admission to the hospital he had had "biliousness," which he described as epigastric distress unrelated to meals, without nausea or vomiting. He had been seen by his physician forty-eight hours before hospitalization because of increasing epigastric pain, which the physician had attributed to "coronary disease." Twenty-four hours later, however, when hematemesis and tarry stools appeared, he was transferred to my care. Questioning elicited the fact that he had lost 25 pounds (11.3 Kg.) in weight during the past year.

Examination in the hospital revealed the patient to be obviously exsanguinated but conscious. The skin was dry and warm. The pulse rate was 110; it was regular but thready. The blood pressure in millimeters of mercury was 94 systolic and 80 diastolic. The only other significant sign was a questionable, ill-defined epigastric mass, not freely movable and not tender. The abdomen was not rigid. A provisional clinical diagnosis of gastrointestinal hemorrhage secondary to ulcerated gastric carcinoma or peptic ulcer was made. This impression was confirmed by a medical consultant, who, independently, also observed and described a palpable epigastric mass.

Laboratory examination revealed the erythrocyte count to be 2,420,000 per cubic millimeter of blood, with 5 Gm. of hemoglobin, or 29.8 per cent. The hematocrit reading showed 19 per cent of packed erythrocytes. The leukocyte count was 12,750 per cubic millimeter of blood, with 85 per cent polymorphonuclears,

---

Submitted for publication Sept. 22, 1955.

12 per cent lymphocytes and 3 per cent monocytes. An electrocardiogram revealed sinus tachycardia causing myocardial embarrassment.

The patient's clinical course was rapidly downhill. No blood was returned through a Levine tube passed into the stomach, and the tube was connected to a continuous Wangensteen suction apparatus. The rectal examining finger delivered some tarry stool.

The patient was given no oral feedings. He was immediately placed in the Trendelenburg position and covered with hot blankets. While the results of blood typing were being awaited, 350 cc. of blood plasma was administered intravenously at the rate of 40 drops per minute, followed by 2,000 cc. of whole blood. Because the blood pressure kept dropping to below shock level (occasionally becoming entirely unobtainable), an attempt was made to support it by repeated intramuscular injections of wyamine sulphate. At no time during treatment did the patient lose consciousness, return blood through the Levine tube or expel bloody or tarry stools.

He died about fourteen hours after admission. The temperature, which had been normal throughout, showed (rectally) a premortem rise to 101.6 F.

Autopsy.—The significant autopsy observations were as follows:

Skin: There was an almost imperceptible scar in the right paranasal region.

Cardiovascular System: The heart showed congestion and edema of the myocardium, with atherosclerotic changes of the aorta.

Lungs: Chronic passive congestion and atelectasis were observed at the bases.

Gastrointestinal System: The esophagus revealed varicose veins and lymphangiectasis, especially at the cardiac junction. There were dilated but collapsed veins in the gastric submucosa. The first part of the duodenum showed marked atrophy of the mucosa. The second portion was the seat of a diverticulum 1 cm. in its greatest dimension, pointing cephalad. The base of the diverticulum was normal. Its lumen was filled with blood, as were also segments of the ileum. The mucosa between the rugae in these areas was extremely thin and almost transparent, the vessels beneath being visible as tortuous veins. In some segments they bulged through the mucosa like varicosities. Similar varicose vessels were noted entering the intestine at the mesenteric attachment. One highly dilated vein in the ileal wall protruded into the lumen, covered by atrophied mucosa stretched to nearly a single layer of cells. Although a definite point of perforation into the intestinal lumen could not be demonstrated, the thinning of the mucosa overlying the dilated vessels strongly suggested the probability of a perforation somewhere in similar areas of ectasia of the vessels.

The pertinent postmortem conclusions were, in summary, massive intestinal hemorrhage, varicosities (phlebectasia) of the mesenteric and submucosal veins of the small intestine and atrophy of the intestinal mucosa.

COMMENT

Although, strictly speaking, "phlebectasia" and "hemangioma" are not interchangeable terms, Kaijser[1] classified these conditions under the same heading. All forms of hemangioma constitute about 6 per cent of all benign tumors and 8.4 per cent of all varieties of neoplasms of the small intestine.[2]

It will be noted that the concurrent discovery of a history of recent loss in weight and a "palpable epigastric mass" led to the erroneous diagnosis of possible ulcerated gastric carcinoma or peptic ulcer. The presence of this mass, confirmed independently by a second examiner, was not verified at autopsy. Furthermore, the history of weight loss (25 pounds, or 11.3 Kg., in one year) proved to be unrelated to the final diagnosis.

Were it not for these two misleading observations, in the absence of any other cause, the possibility of a bleeding tumor of the small intestine might (and should) have been considered.

SUMMARY

1. A case of massive fatal gastrointestinal hemorrhage in an elderly man is presented.

2. In the absence of a definite history or of physical indications suggesting peptic ulcer, ulcerated gastric carcinoma or ruptured esophageal varices, bleeding from eroded small intestinal neoplasms must be considered.

3. In the case reported, hemorrhage occurred from multiple submucous varicosities (phlebectasia), covered with atrophic mucosa, of the small bowel.

RÉSUMÉ

1. Un cas d'hémorrhagie gastro-intestinale totale, massive et mortelle chez un homme agé est presenté.

2. En cas qu'il n'existe pas l'histoire definie ou les symptomes cliniques d'un ulcère peptique, un cancer le l'estomac ulcéré ou des varices oesophagiennes rupturées, il faut considérer comme source de l'hémorrhagie un petit néoplasme intestinale érodé.

Dans le cas reporté l'hemorrhagie venait de nombreuses varices (phlebectasies) submuqueuses de l'intestin grêle, couvertes d'une membrane muqueuse atrophique.

ZUSAMMENFASSUNG

1. Es wird ein Fall von tödlicher Magendarmblutung bei einem älteren Mann dargestellt.

2. Da weder die Anamnese noch die körperliche Untersuchung Anzeichen von peptischem Geschwür, geschwürigem Magenkrebs oder geplatzten Speiseröhrenvarizen ergab, musste die Möglichkeit einer Blutung von einer erodierten Geschwulst des Dünndarms in Betracht gezogen werden.

3. Im vorliegenden Falle ging die Blutung von mehreren submukösen Venenerweiterungen (Phlebektasien) des Dünndarms, die mit atrophischer Schleimhaut bekleidet waren, aus.

RIASSUNTO

1. Viene riferito il caso di un paziente di età morto in seguito ad emorragia gastrointestinale massiva.

2. In mancanza di un'anamnesi probativa per ulcera o per cancro ulcerato o per varici esofagee, bisogna prendere in considerazione l'ipotesi del tumore intestinale ulcerato.

3. Nel caso riferito la emorragia proveniva da numerose varicosità submucose (flebectasie) ricoperte da mucosa atrofica, a sede nel tenue.

REFERENCES

1. Kaijser, R.: Uber Hamamgiome des Tractes Gastrointestinales, Arch. f. klin. Chir. 187: 251, 1937.

2. Hansen, P. S.: Hemangioma of the Small Intestine, with Special Reference to Intussusception, Am. J. Clin. Path. 18:14, 1948.

Bashfulness is an ornament to youth, but a reproach to old age.

—*Aristotle*

Nothing is so easy as to deceive one's self; for what we wish, that we readily believe.

—*Demosthenes*

How can we expect another to keep our secret, if we cannot keep it ourselves?

—*La Rochefoucauld*

Cardiovascular Surgery

Some Experimental Methods for Arterialization of the Liver: The Aortosplenic Anastomosis

MANFREDI SERVELLO, M.D., AND RENATO PETRONIO, M.D.
PADUA, ITALY

THE creation of arteriovenous shunts between the general arterial and the portal system as a means of achieving arterialization of the liver has a long experimental history, beginning with the first attempts of Narath (who experimented with splenorenal or hepatoportal anastomosis) and continuing to the more recent attempts of American authors (Fisher and his collaborators), who anastomose a sectioned portal trunk with the aorta by means of a venous autograft. The clinical application of this procedure, however, is recent and is still being studied. Up to the time of writing, only a few Italian authors (Pettinari, 3 cases; Valdoni, 2 cases; Trivellini, 2 cases; Muntoni, 3 cases) have succeeded in anastomosing the splenic artery and vein in man for arterialization of the liver. Several authors have adjudged the postoperative results to be good, but the statistics are too meager to allow a definitive opinion.

The aims of a surgical operation for arterialization of the liver are twofold:

1. To make it possible to revascularize the liver with arterial blood in cases in which the hepatic artery no longer functions, owing to aneurysms, surgical accidents, etc.
2. To study the influence of arterialized portal blood in cases of hepatic cirrhosis or other hepatic pathologic processes.

The latter objective has been valved by some authors in their original studies of hepatic cirrhosis. For example, Paterni described four points of departure in the pathogenesis of this illness: (a) parenchymal alterations; (b) sinusoid ischemia; (c) neoformations of connective tissue, and (d) new vascularization of the newly formed connective tissue (independent of the sinusoid circulatory disorder of the parenchyma), which is connected to the interlobular branches of the hepatic artery and the portal vein.

The portal arterialization should influence and combat the sinusoid ischemia; i.e., the principal cause of the cirrhosis, the beginning of the vicious cycle that leads progressively to total sclerosis.

In the Institute of Surgical Pathology of the University of Padua, the question of portal arterialization has been studied for many years, and one of its first applications to man has been accomplished.

We have been among the first to study

From the Istituto di Patologia Chirurgica e Propedeutica Clinica della Universita di Padova, Prof. Vittorio Pettinari, Director.

Submitted for publication Sept. 5, 1955.

the problem experimentally, constructing arteriovenous connections between the splenic artery and vein or between the splenic artery and the portal vein in the dog. By this method we attempted to discover what the histologic and histochemical picture of the hepatic parenchyma and that of the circulation would be after a lapse of time. In the dog, however, this procedure presents some technical inconveniences that do not permit a study of the problem on a large scale.

We should like, therefore, to examine various experimental methods of arterialization of the liver in an attempt to arrive at some general conclusions.

Methods. — Experimental methods for creating an arteriovenous fistula between the general arterial system and the portal system can be practically reduced to the following types:

1. *Anastomosis Between the Left Renal Artery and the Splenic Vein:* (Fig. 1*A*) was performed for the first time by Narath. It is accomplished by direct inosculation of the artery and vein after the spleen and left kidney have been removed. This type of operation, however, was soon abandoned by Narath himself and was never subsequently considered. The technic involves two serious inconveniences; the first is common to the majority of fistulas created by inosculation, namely, thrombosis of the anastomosis; the second is the risk of eliminating two important organs.

2. *Anastomosis Between the Hepatic Artery and the Portal Vein* (Fig. 1*B*): This technic was also devised by Narath and was studied by Shilling, Bariatti and their co-workers. It is performed by means of inosculation, after the hepatic artery has been divided to its point of bifurcation into two terminal branches, all the collaterals having been simultaneously tied off. The arterial blood is thus diverted from its normal tract to the portal vein. The procedure can be traumatic and even lethal to the animal, because of the total interruption of arterial blood. In fact, if thrombosis of the shunt arises, as it frequently does, the death of the dog is inevitable.

3. *Anastomosis Between the Splenic Artery and Vein* (Fig. 1*C*): This method has been praised by Paterni and experimentally studied by us. It is achieved by direct inosculation of the artery into the vein after removal of the spleen. In this type of procedure the postoperative risk of death for the animal is minimized, but the function of the shunt is hindered in 65 per cent of the cases. In fact, of the 8 dogs undergoing arteriovenous splenosplenic shunts, only 3 presented a good functional anastomosis—a result obtained by constant administration of heparin. This procedure, therefore, can be applied to man, in whom the vessels have a larger caliber and an anastomosis by means of an everted suture of the cut edges of the vessels can be achieved; it is less advisable in experimental surgery.

4. *Anastomosis Between the Splenic Artery and the Portal Vein* (Fig. 1*D*): This approach was praised by Paterni. I have performed it experimentally in association with the preceding experiment. It is done by inosculation, and the same technic is used as in anastomosing the hepatic artery and the portal vein. There is a difference, however, in the results of the two procedures, in that the normal hepatic arterial blood is not led elsewhere but is appreciably augmented. In our experience, the fistula becomes thrombotic with the same frequency as after the splenosplenic anastomosis. In addition, there is a major operative risk because of manipulation of the portal trunk.

5. *Anastomosis Between the Aorta and the Portal Vein by Means of a Venous Autograft* (Fig. 1*E*): This operation was conceived by several American authors

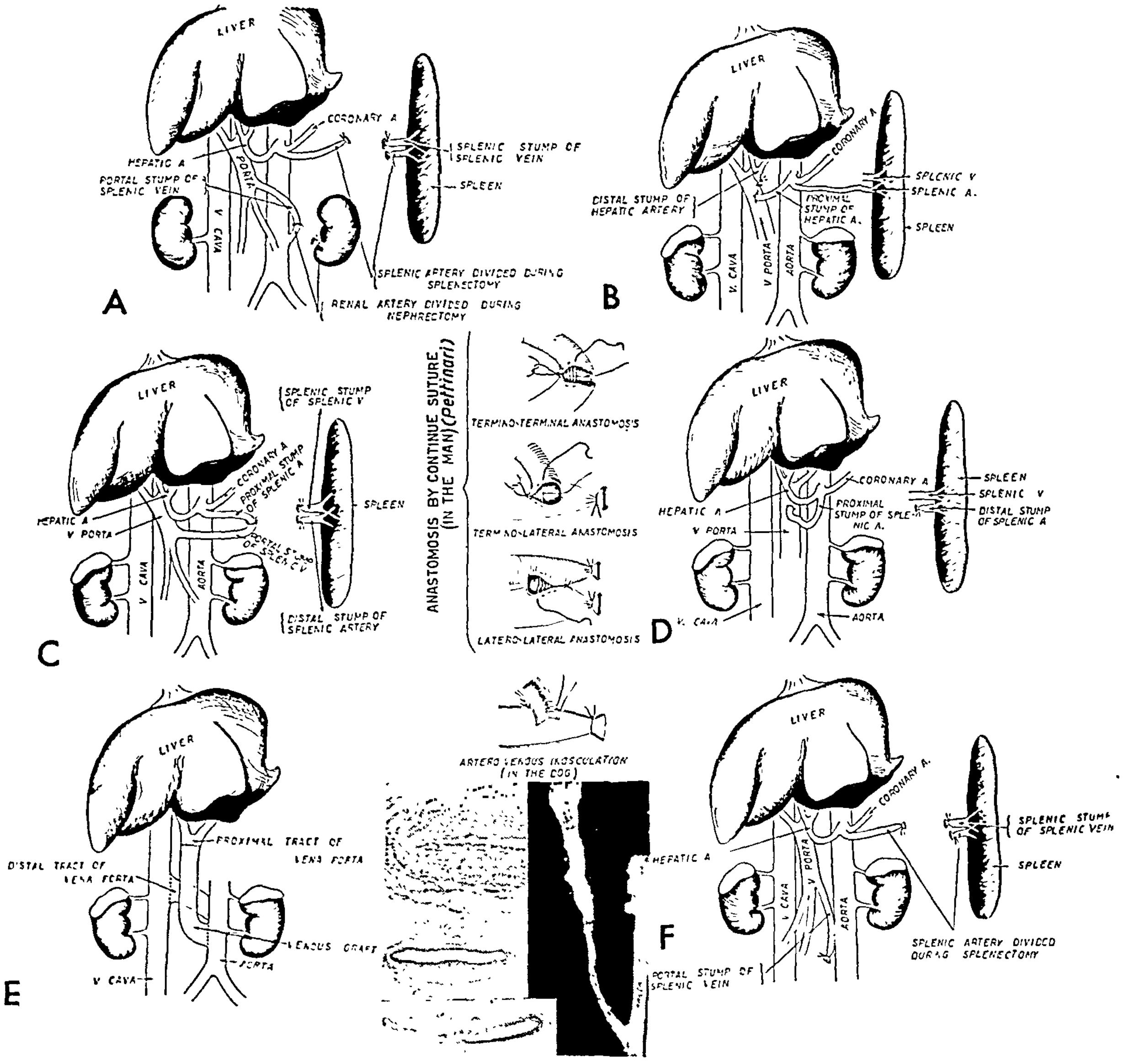

LIVER
CORONARY A
HEPATIC A
PORTAL STUMP OF SPLENIC VEIN
PORTA
V CAVA
SPLENIC STUMP OF SPLENIC VEIN
SPLEEN
SPLENIC ARTERY DIVIDED DURING SPLENECTOMY
RENAL ARTERY DIVIDED DURING NEPHRECTOMY
A
LIVER
CORONARY A
DISTAL STUMP OF HEPATIC ARTERY
PROXIMAL STUMP OF HEPATIC A.
SPLENIC V
SPLENIC A.
SPLEEN
V. CAVA
V PORTA
AORTA
B
ANASTOMOSIS BY CONTINUE SUTURE (IN THE MAN) (Pettinari)
TERMINO-TERMINAL ANASTOMOSIS
TERMINO-LATERAL ANASTOMOSIS
LATERO-LATERAL ANASTOMOSIS
LIVER
SPLENIC STUMP OF SPLENIC V
CORONARY A
PROXIMAL STUMP OF SPLENIC A
SPLEEN
HEPATIC A
V PORTA
PORTAL STUMP OF SPLENIC V
V CAVA
AORTA
DISTAL STUMP OF SPLENIC ARTERY
C
LIVER
CORONARY A
SPLEEN
SPLENIC V
HEPATIC A
PROXIMAL STUMP OF SPLENIC A.
DISTAL STUMP OF SPLENIC A
V PORTA
V. CAVA
AORTA
D
LIVER
PROXIMAL TRACT OF VENA PORTA
DISTAL TRACT OF VENA PORTA
VENOUS GRAFT
AORTA
V CAVA
E
ARTERO VENOUS INOSCULATION (IN THE DOG)
LIVER
CORONARY A.
HEPATIC A
SPLENIC STUMP OF SPLENIC VEIN
SPLEEN
V CAVA
V PORTA
AORTA
SPLENIC ARTERY DIVIDED DURING SPLENECTOMY
PORTAL STUMP OF SPLENIC VEIN
F

Fig. 1.—Various methods of arterializing the liver: *A*, arteriovenous shunt (inosculation) between the left renal artery and the splenic vein (Narath). *B*, anastomosis (inosculation) between hepatic artery and portal vein (Shilling; Bariatti-Servello-Taccani). *C*, arteriovenous shunt (inosculation) between splenic artery and vein (Paterni-Servello-Rossi). *D*, arteriovenous shunt (inosculation) between splenic and portal vein. (Paterni-Servello-Rossi). *E*, anastomosis between the aorta and the proximal trunk of the portal vein by means of a venous autograft. (From Fisher). *F*, laterolateral anastomosis between the aorta and the splenic vein (Servello-Petronio). *Inset*, photograph showing, on the right, the microscopic appearance of the anastomosed vessels; on the left, reading from top to bottom the histologic appearance of the two anastomosed vessels, the splenic vein and the portal vein respectively.

(Jamison, Chon, Fisher, and their respective co-workers). It consists in complete suppression of portal blood (which is then conveyed to the vena cava) and the complete substitution of arterial blood. The technic is undoubtedly delicate and difficult; it is necessary to dissect out a segment of a vein, the jugular, for example,

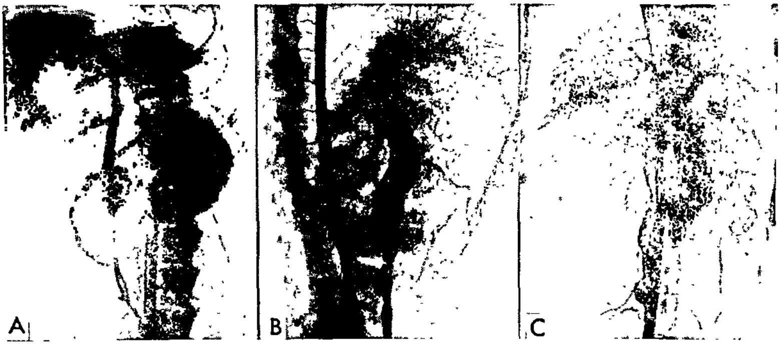


Fig. 2.—*A*, aortograms showing evidence of passage of the radiopaque matter from the aorta into the splenic vein and then into the vena porta, up to its smaller ramifications. *B*, aortogram of a dog killed two months after the operation. Well-functioning fistula and massive injection of the vena porta are visible. *C*, hepatogram. Note that the dilated sinusoids are visible after aortosplenic anastomosis.

and to anastomose one end of it to the aorta by means of a terminoterminal suture, and the other end to the proximal trunk of the portal vein, which will therefore convey only arterial blood to the liver. The distal trunk of the portal vein is anastomosed to the vena cava.

6. *Anastomosis Between the Aorta and the Splenic Vein* (Fig. 1*F*): Conceived recently by us, this procedure is technically easy and always results in a pervious fistula. It is performed on dogs under general anesthesia, with a left pararectal cutaneous incision. The splenic hilum is carefully prepared, the artery being tied off at its point of origin and the largest venous ramifications isolated to the extreme periphery. Splenectomy is then performed. Immediately after this, the aortic trunk below the point of origin of the renal arteries is prepared, and, after the most important collaterals have been tied off, all the periarterial adventitia is removed. A special forceps with three blades is then applied, which brings together the two vessels that are to be sutured. First, the splenic vein is fixed in the instrument, and a 2 cm. incision is made in it. The aorta is then similarly fixed and cut. Next, the cut edges of aorta and vein are joined by means of a continuous everted suture. The fistula begins to function immediately, as evidenced by the thrill that can be noticed in the portal trunk.

Results.—I have performed this operation on 20 dogs without a death, and each operation has resulted in a completely pervious fistula. Aortographic study (Fig. 1, *inset*), made possible by catheterization of the right femoral artery, shows that the splenic vein has not undergone any aneurysmal dilatation. The openings of the mesenterics, inferior and superior, is represented in the aortogram by two light transparent rings along the borders of the splenic vein and the portal trunk. This proves that the intestinal blood, despite the arterial pressure that exists in the vein, flows regularly into the portal system. Even macroscopically I have never observed intestinal stasis. The intrahepatic injection of a radiopaque substance makes evident a remarkable dilatation of the sinusoid bed, which extends far as the extreme periphery (Fig. 2). Undoubtedly the systolic thrust in the hepatic bed stimulates the liver to a state of hyperfunction, since it puts into circulatory movement even those lobular zones which normally are at rest and which begin functioning at particular moments (for example, during digestion). The injection of india ink into the portal trunk and histologic observation of the parenchyma, whose most intimate circulation can thus be seen (Fig. 3*A*), confirms what can already be asserted on the basis of the hepatogram. The vessels are massively injected and the sinusoids are dilated and full of blood; this is an expression of active intralobular circulation, with an increase of the volume of blood per unit of time.

The hepatic parenchyma undergoes no degenerative change whatsoever; rather it seems to be stimulated to cellular hyperfunction. In fact, it can be demonstrated histologically that there is a perfect conservation of the cells, which present finely granular cytoplasm and well-colored nuclei (Fig. 3*B*). In some sections a slight deformity of the cellular contour can be

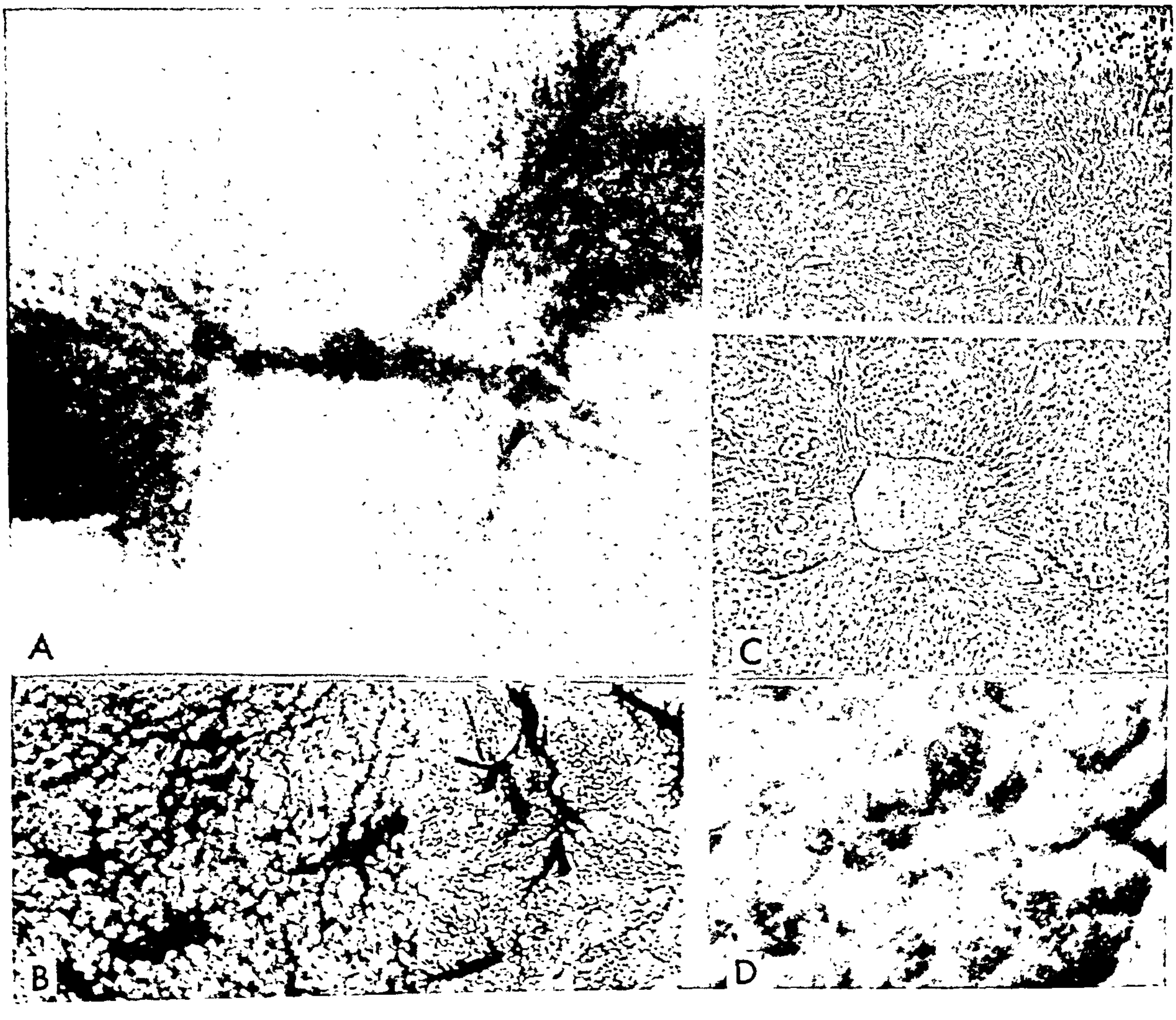


Fig. 3.—*A*, massive injection of vessels and dilatation of sinusoids after introduction of India ink in the aorta. *B*, perilobular and intralobular vasal dilatation with normal cellular aspect. *C*, histochemical preparation, showing the glycogen content of the hepatic cells after anastomosis.

observed; this is due to pressure of the dilated sinusoids. Even the specific reactions for glycogen help to demonstrate that the hepatic cell is functioning perfectly, for it is full of glycogen in active metabolism (Fig. 3*C*). The normal reticular makeup of the liver shows no noteworthy modifications.

CONCLUSION

Anastomosis between the aorta and the splenic vein is the experimental method chosen to study the effect of the arterialization of the portal vein in the normal and in the pathologic liver. This method allows large quantities of oxygenated blood to be conveyed to the portal bed, without excluding from hepatic metabolism the intestinal flow, an inconvenience that actually occurs when anastomosis between the aorta and the portal vein (by means of the autograft of a venous section). As compared to this system, my method has the advantage of being technically simple.

The aortosplenic anastomosis always remains pervious, even after several months, as has been observed in my controls. This is true in small part even of anastomoses between the splenic artery and vein or between the splenic artery and the portal vein, which I have already described. The last-mentioned procedures, however, because of the small caliber of the vessels, can be accomplished only by inosculation of the artery into the vein, while the anastomosis devised by myself is performed by joining the edges of the vessels with an everted suture. It has, moreover, the same advantages as the renosplenic anastomosis, in which, among other things, it is necessary to sacrifice an important organ, e.g., the left kidney, in addition to the spleen.

It is preferable, finally, to the hepatoportal anastomosis, since this type of operation causes deviation of arterial blood from its normal path to a venous one. In these circumstances an increase of the blood flow into the intrahepatic vascular bed can be achieved, but certainly not an increase of oxygen, such as occurs with the aortosplenic anastomosis.

The hepatic parenchyma displays an important hypermetabolic activity and excellent toleration of the new circulatory conditions. In my opinion, therefore, the aortosplenic anastomosis is the best possible means of solving the experimental problem of arterialization of the liver, since it permits simple and accurate study of a great number of animals.

SUMMARY

The different experimental methods of arterializing the portal blood are reviewed, and a personal procedure is described. This consists in a laterolateral anastomosis between the aorta and the splenic vein, after splenectomy. The authors have performed it on the dog with success. Its complete reliability and the perfect condition of the hepatic parenchyma are demonstrated, even after a long period, by aortographic and hepatographic studies and by histologic and histochemical examination.

ZUSAMMENFASSUNG

Es wird ein Überblick über die verschiedenen experimentellen Methoden der Arterialisierung des Pfortaderblutes gegeben und das eigene Verfahren des Verfassers beschrieben, das in einer Seite-zu-Seite-Anastomose zwischen Aorta und Milzvene nach Entfernung der Milz besteht, und das von den Verfassern im Hundeversuch ausgeführt wurde. Die völlige Zuverlässigkeit der Methode und die ausgezeichnete Verfassung, in der sich selbst nach langer Zeit das Leberparenchym in ihren Fällen befand, werden an

Hand von aortographischen, hepatographischen, histologischen und histochemischen Untersuchungen dargelegt.

RIASSUNTO

Rassegna dei vari metodi sperimentali per l'arterializzazione del sangue portale; descrizione di un metodo personale che consiste in un'anastomosi laterolaterale fra la aorta e la vena splenica dopo splenectomia; gli autori hanno sperimentato questo metodo nei cani. L'aortografia, le epatografie, gli esami istologici ed istochimici hanno dimostrato la perfetta idoneità del metodo.

RÉSUMÉ

Les differentes méthodes experimentelles pou l'artérialisation du sang portal sont revisées et une procédure personelle est decrite, qui consiste en anastomose latéro-latérale entre l'aorte et la veine splénique après splectomie. Cette méthode a été exécutée par l'auteur experimentellement au chien. La surete absolue de la methode et la condition parfaite du parenchyme hépatique dans ces cas, même après une longue période, sont demontrées par des études aortographiques et hépatographiques et par des examens histologiques et histochémicales.

BIBLIOGRAPHY

Bariatti, R.; Servello, M., and Taccani, C.: Creazione di anastomosi artero-venosa epatico-portale, Arch. ed. Atti Soc. Ital. Chir. 52, 1950.

Cohn, R., and Herrod, C.: Some Effects upon the Liver of Complete Arterialization of Its Blood Supply, Surgery 32:214, 1952.

Fisher, B.; Russ, C., and Updegraff, H.: A Suitable Technic for Total Arterialization of the Dog Liver, Surgery 35:879, 1954.

Jamison, W. L.; Dugan, T. J.; Bailey, C. P., and Ramirez, H. P. R.: Experiences in Experimental Porto-Caval Anastomosis, Surgery 30:484, 1951.

Muntoni, E.; Arch. ed. Atti Soc. Ital. Chir. 56, 1954.

Narath, V.: Uber Entstehung des anämische Lebernekrose nach Unterbindung der arteria hepatica und ihre Verhütung durch artero-portal anastomose, Deutsch. Zeit. Chir. 135:305, 1916.

Paterni, L.: Disordine circolatorio del fegato nelle cirrosi. Orientamenti in terapia chirurgica, Policlinico Sez. Pratica 56:253, 1949.

Pettinari, V.: Moderni indirizzi e realizzazioni nella terapia chirurgica della cirrosi epatica, Boll. Soc. Piemontese Chirurgica 22:2, 1952. Ipersplenismo, iperpressione portale e splenopatie cirrogene, Chirurgia e Patologia Sperimentale 2:4, 1954. Iperpressione portale e suo trattamento chirurgico, Soc. Medica di Verona, Feb. 15, 1955.

Servello, M., and Rossi, R.: Studio istochimico sul comportamento del glicogeno, dei lipidi, delle fosfatasi alcaline e degli acidi nucleinici epatici dopo arterializzazione della porta mediante anastomosi artero-venosa, Pat. Sperimentale e Chirurgia 1:352, 1953. L'arterializzazione del fegato mediante anastomosi artero-venose spleno-spleniche e spleno-portali, Chirurgia 8:2, 1953.

Shilling, McKee and Wilt: Experimental Hepatic-Portal Arterio-Venous Anastomoses, Surg., Gynec. & Obst. 90:473, 1950.

Trivellini, A.: Problemi di chirurgia nell'ipertensione portale: L'arterializzazione portale, Arch. ed. Atti Soc. Ital. Chir. 56, 1954.

Valdoni, P.: In Lanzara, Ipertensione portale. Recenti Prog. in Med. 12:191, 1952.

No one is likely to remember what is entirely uninteresting to him.

—*Macdonald*

What we learn with pleasure, we never forget.

—*Mercier*

We exaggerate misfortune and happiness alike. We are never either so wretched nor so happy as we say we are.

—*Balzac*

The "Middle Colic Artery"

Its Position, Its Name and Its Surgical Dangers*

HARRY J. FOURNIER, M.D., F.I.C.S.
CHICAGO, ILLINOIS

THE name "middle colic artery," given to this important vessel by Franck, should not convey the impression that this vessel is necessarily to be found in the middle of the transverse mesocolon. Rather, it should imply that this artery supplies the middle part of the colon, that is, the transverse portion, just as the right colic and left colic arteries supply the right and left halves of the colon respectively.

Indeed, nothing could be anatomically more inaccurate and surgically more dangerous than to allow oneself to be misled by its name into the delusion that this vessel occurs in the *middle* of the transverse mesocolon, as the term "middle colic artery" seems so strongly to imply.

Of course, there are cases in which the "middle colic artery" does lie right in the middle of the transverse mesocolon, but these are exceptional. As a rule, and this is attested to by an enormous literature on the subject, the "middle colic artery," after it arises from the superior mesenteric artery just under the inferior border of the pancreas, is directed toward the hepatic angle of the colon. A few centimeters before it reaches that structure it bifurcates into an ascending and a descending branch. The descending branch anastomoses with the ascending branch of the right colic artery, while the ascending branch, much longer than the descending one, forming the right pillar of Riolan's arcade, anastomoses with the ascending branch of the left colic artery. Near the hepatic angle of the colon the two branches (ascending and descending) form anastomoses between them in the form of arcades (aqueduct or fanlike structures), or they merely give out short straight vessels of the brushlike variety (Figure 4). The "middle colic artery," in its course toward the hepatic angle of the colon, first passes above the third portion of the duodenum in front of the superior mesenteric vein, then in front of the second portion of the duodenum, after which it approaches closely the gastroduodenal, the pancreaticoduodenal and particularly the right gastroepiploic artery (Fig. 1*A*).

This proximity is especially close when the root of the transverse mesocolon is thickened owing to adhesions. One can then easily see that this close proximity in this area, when a gastric or pancreatic operation is performed, becomes really dangerous to the safety of this vessel even in the presence of a normal anatomic picture, let alone when the unsuspecting surgeon is confronted with tissues full of inflammatory adhesions or distorted by invading tumors. This is true especially if one finds the "middle colic artery" pushed up against the right gastroepiploic artery or the gastroduodenal vessels, where it may be easily mistaken for one of them and ligated with disastrous results.

Grégoire, in his desire to remind the surgeon constantly of the real position of this vessel and to supply an accurate description of the course it follows, sought

---

*This work was done in the department of Anatomy, College of Medicine, of the University of Illinois, at which the author has been teaching Surgical Anatomy for twelve years.

Submitted for publication Oct. 27, 1955.

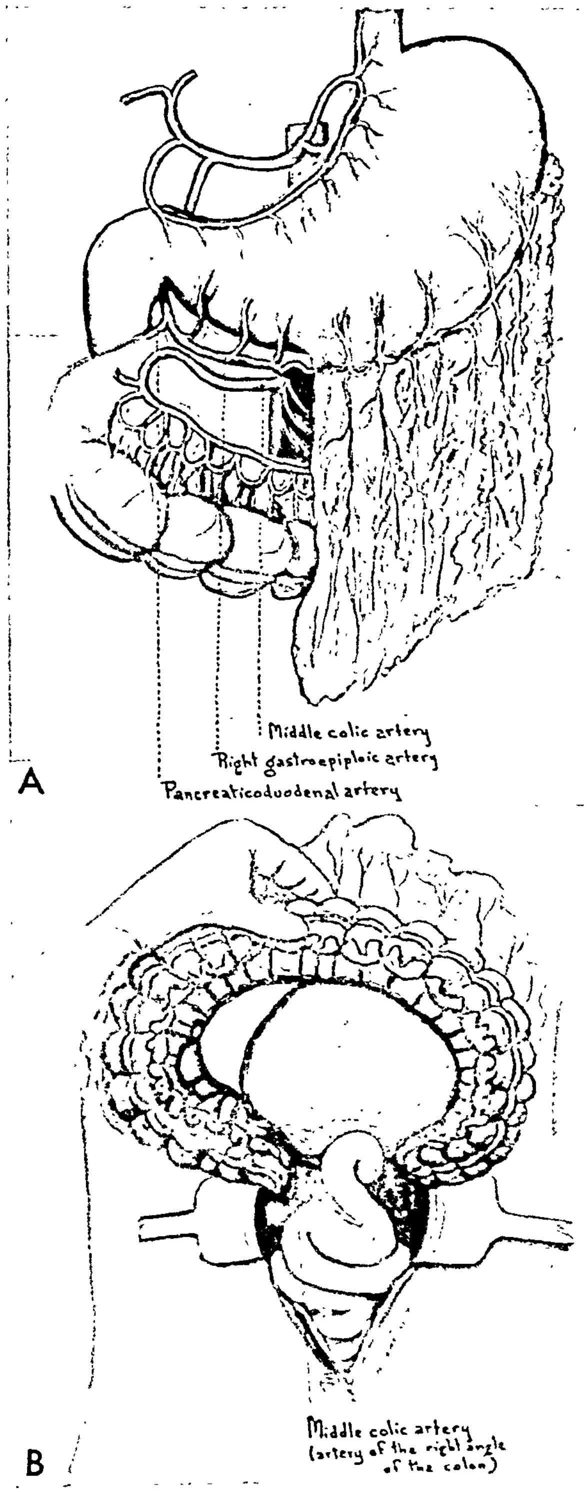

Middle colic artery
Right gastroepiploic artery
Pancreaticoduodenal artery
A
Middle colic artery
(artery of the right angle of the colon)
B

Fig. 1.—*A*, extreme deviation of middle colic artery (artery of transverse portion of colon) to right. Note its proximity to pancreaticoduodenal and right gastroepiploic vessels. *B*, middle colic artery shown in one of its most frequent positions, at right of transverse mesocolon and toward right colic angle.

to change its name to "artery of the right colic angle." Okinczyc and J. Gosset, for similar reasons, called this vessel "the artery of the transverse colon."

As a matter of fact, the French textbooks of anatomy, being more specific in this instance, call the "middle colic artery" the "right superior colic artery," thus describing on the right side of the colon three colic vessels running like the rungs of a step ladder, one above the other: (1) Right superior colic artery (instead of the "middle colic artery" of American textbooks); (2) right middle colic artery (for the right colic artery), and (3) inferior colic artery (for the colic branch of the ileocolic artery).

Only in the rare instances in which the "middle colic artery" actually runs in the center of the transverse mesocolon is that vessel called "arteria colica media." In these cases, as one can readily understand, the avascular window formed by the arcade of Riolan becomes quite small, making a transmesocolic gastrojejunostomy

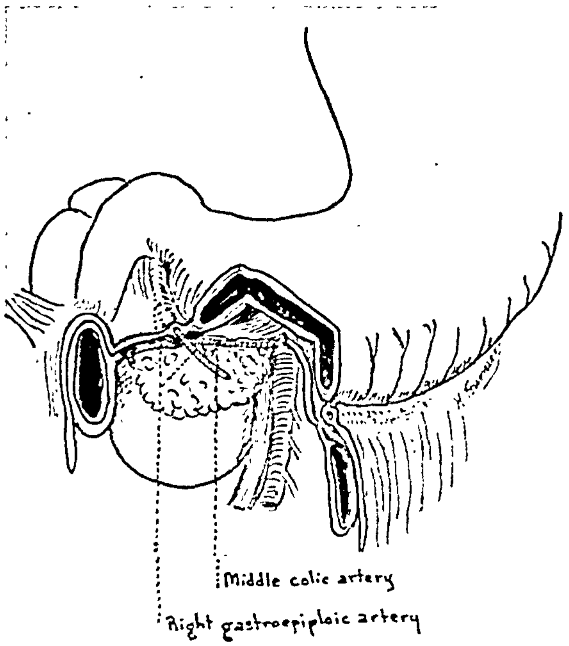


Fig. 2.—Schematic presentation, showing proximity of middle colic artery to right gastroepiploic artery.

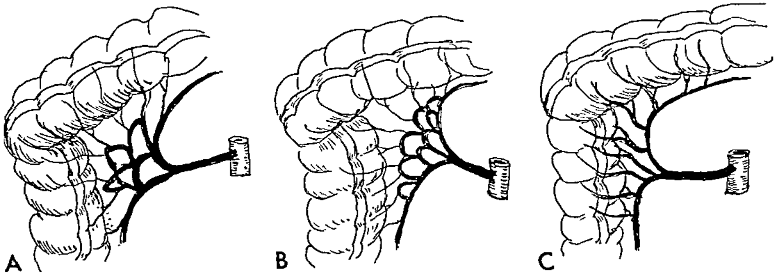


Fig. 3.—Types of arcades of middle colic artery according to F. Paitre. *A*, aqueduct type; *B*, fan type; *C*, brush type.

difficult, if not impossible.

That a student of anatomy or even a surgeon can easily be misled by the name "middle colic artery" as to the exact position of the vessel and its relation to other vessels, especially in an attempt to ligate the right gastroepiploic artery, has been repeatedly proved by many queries to students and doctors.

SUMMARY

The author emphasizes the following points:

1. There is a proximity of the "middle colic artery" to the branches of the gastroduodenal artery; that is, to the pancreaticoduodenal artery, and particularly to the right gastroepiploic artery, in the right upper portion of the abdominal cavity.

2. This proximity is dangerous when one performs a gastric or pancreatic operation, in which the "middle colic artery" may be mistaken for the pancreaticoduodenal artery, or, especially, the right gastroepiploic artery and ligated with disastrous effects.

3. In the author's opinion, the term "middle colic artery" is inaccurate and misleading; that is, it does not warn the surgeon of this dangerous proximity. On the contrary, it lulls him into a false security and makes him believe that when working on the right side of the upper abdomen he will never encounter the "middle colic artery" there, though all the time this important vessel is situated at that place.

4. In order to prevent this misnomer from misleading the surgeon as to the exact location of this important vessel (which is to the right), one has two alternatives: (1) to drop this name completely, replacing it either with "right superior

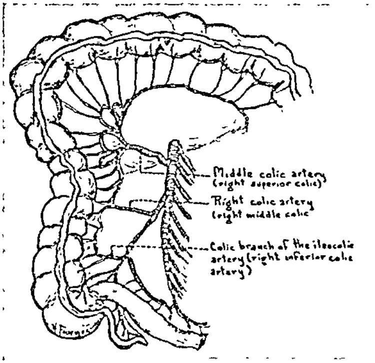

Middle colic artery (right superior colic)
Right colic artery (right middle colic
Colic branch of the ileocolic artery (right inferior colic artery)
V. Fournier

Fig. 4.—Middle colic artery at right of transverse mesocolon (its most frequent position) forming, with right colic artery and colic branch of ileocolic artery, three rungs of stepladder. This arrangement justifies terms used in French textbooks to designate these ves (see te.

colic artery," "artery of the hepatic angle of the colon" or "artery of the transverse colon," and (2) never to use the term "middle colic artery" without adding one of the aforementioned names, all of which indicate its position and course in an accurate and practical way.

5. The name "middle colic artery" should be retained for those exceptional cases in which this vessel is actually present in the middle of the transverse mesocolon, the only cases in which its use is justified.

RESUMEN

El autor señala los puntos siguientes:

1. En la parte superior y dercha de la cavidad abdominal hay cercanía entre la arteria cólica media y la gastroduodenal, es decir la pancreaticoduodenal y particularmente la arteria gastroepiploica derecha.

2. Esta cercanía entre estas estructuras es peligrosa cuando se realizan operaciones gástricas o pancreáticas en las cuales la arteria cólica media puede ser ligada por error en vez de la pancreaticoduodenal o en particular, en vez de la gastroepiploica derecha.

3. El término de "cólica media" es incorrecto y no advierte al cirujano de su peligrosa cercanía. Por el contrario, le da una falsa seguridad cuando trabaja en lado derecho del cuerpo: sin embargo, el vaso esta situado allí y fácilmente puede ser ligado por error, con los resultados fatales consiguientes.

4. Con el objeto de estar prevenido en relación con la situación de este vaso importante, hay dos alternativas: (1) Substituir su nombre por el de "arteria cólica superior derecha," "arteria del ángulo hepático del colon" o "arteria del colon transverso," y (2) no usar nunca el término de "arteria cólica media" sin mencionar alguno de los normbres ya mencionados que indican su situación y su curso en forma práctica y exacta.

El nombre de "arteria cólica media" debe conservarse únicamente para aquellos casos excepcionales en los cuales el vaso se encuentra de hecho en la parte media del colon transverso, circunstancia en la cual su uso si se encuentra justificado.

ZUSAMMENFASSUNG

Der Verfasser hebt die folgenden Punkte hervor:

1. Die A. colica media verläuft in enger Nachbarschaft mit den Ästen der A. gastroduodenalis, d.h.der A. pancreaticoduodenalis und der A. gastroepiploica im rechten oberen Abschnitt der Bauchhöhle.

2. Diese enge nachbarliche Beziehung schliesst die Gefahr ein, dass bei Ausführung von Magen-oder Bauchspeicheldrüsenoperationen versehentlich die mittlere A. colica anstatt der A. pancreaticoduodenalis oder besonders anstatt der rechten A. epiploica unterbunden wird.

3. Die Bezeichnung "mittlere Dickdarmarterie" ist unzulänglich, weil sie dem Chirurgen keinen warnenden Hinweis auf die gefährliche Nähe der anderen Schlagadern bietet. Der in der rechten Körperhälfte arbeitende Chirurg wird eher verleitet, sich in der unberechtigten Sicherheit zu wiegen, dass er in dieser Gegend niemals der mittleren Dickdarmarterie begegnen kann, obgleich dieses wichtige Gefäss tatsächlich immer sehr nahe der rechten Seite verläuft, wo es leicht irrtümlicherweise und mit verheerenden Folgen unterbunden werden kann.

4. Um einem irreführenden Eindruck von der genauen Lage dieses wichtigen Gefässes (in der rechten Bauchhälfte!) aus dem Wege zu gehen, gibt es zwei Möglichkeiten: 1) Man kann den Namen völlig fallen lassen und ihn durch einen anderen, etwa "rechte obere Dickdarmarterie," "Arterie der Flexura hepatica des Dickdarms" oder "Arterie des Colon transversum" ersetzen. 2) Man kann sich

daran gewöhnen, die Bezeichnung "mittlere Dickdarmarterie" niemals ohne Hinzufügung eines der oben erwähnten Namen, die alle in genauer und praktischer Weise die Lage und der Verlauf des Gefässes angeben, zu verwenden.

Die Bezeichnung "mittlere Dickdarmarterie" sollte für die wenigen Ausnahmefälle reserviert bleiben, in denen das Gefäss wirklich in der Mitte des Mesocolon transversum verläuft und damit diesen Namen rechtfertigt.

RIASSUNTO

L'autore sottolinea i seguenti punti: vi è un punto in cui l'arteria colica media corre in vicinanza delle branche dell'arteria gastroduodenale: ossia delle arterie pancreaticoduodenale e aprticolarmente della gastroepiploica destra nella porzione superiore destra della cavità addominale.

2. Questa vicinanza è pericolosa quando si fà un'operazione gastrica o pancreatica in cui l'arteria colica media può venire legata scambiandola per l'arterai pancreaticoduodenale o, specialmente, per l'arteria gastroepiploica destra.

3. Il termine di arteria colica media non è esatto ossia—non mette in guardia il chirurgo sul pericolo della vicinanza. Al contrario lo porta ad una erronea sicurezza così che lavorando al lato destro dell'addome non vi incontrerà mai l'arteria colica media sebbene semprequesto vaso così importante sia situato talmente vicino alla destra che può benissimo essere erroneamente legato con disastrosi risultati.

4. Per prevenire ciò si hanno 2 alternative: 1) eliminare questo nome completamente rimpiazzandolo con "arteria colica superiore destra," "arterai dell'angolo epatico del colon" o "arteria del colon trasverso" e 2) non usar mai "arteria colica media" senza aggiungere anche una delle sunnominate definizioni, che indicano la sua posizione in modo pratico e preciso. Il nome "arteria colica media" dovrebbe essere usato solo in quei casi eccezionali in cui tale vaso è davvero presente in mezzo al mesocolon trasverso.

RÉSUMÉ

L'auteur accentue les points suivants:

1. L'artère "Middle Colic Artery" (artère colique droite supérieure des textes français) s'approche des branches de l'artère gastro-épiploique droite à la partie supérieure de la cavité abdominale.

2. Cette proximité est dangereuse pendant une opération gastrique ou pancréatique, si l'opérateur se trompe et lie l'artère colique droite supérieure au lieu de l'artère gastro-épiploique droite.

3. Le nom "Middle Colic Artery" est inexact parce qu'il n'avertit pas le chirurgien de cette proximité dangereuse. Au contraire, il l'ensevelit dans une fausse securité, en le faisant croire qu'en travaillant sur le côté droit de l'abdomen supérieur iln'y rencontrerait jamais ce vaisseau important tandis que tout le temps cette artère est là.

4. Pour ôter ce malentendu dangereux résultant du nom "Middle Colic Artery," il y a deux alternatives:

a. D'éliminer ce nom et le remplacer par "Artery of the Hepatic Angle of the Colon" ou "Superior Right Colic Artery" ou même "artery of the Transverse Colon."

b. Ne jamais se servir du nom "Middle Colic Artery" sans le faire accompagner par un de noms sus-mentionnés qu'indiquent sa course exactement et pratiquement.

5. Le nom "Middle Colic Artery" devait être reservé seulement à ces cas exceptionels où ce vaisseau est vraiment situé au centre du mesocôlon transverse.

SUMARIO

O autor friza os seguintes pontos:

1. Existe uma proximidade da artéria cólica média aos ramos da artéria gastro-

duodenal; isto é, às artérias pancreatico-duodenal e particular à gastroepiplóica direita na porção superior direita da cavidade abdominal.

2. Esta proximidade é perigosa quando se faz uma operação gástrica ou pancreática, na qual a artéria cólica média pode ser ligada por engano para a artéria pancreatico-duodenal ou especialmente a artéria epiplóica direita.

3. O têrmo "artéria cólica média" é não avisa o cirurgião daquela proximidade perigosa. Ao contrário, o mantem numa falsa segurança, de maneira que ao trabalhar do lado direito do corpo, nunca lá encontrará a artéria cólica média, embora durante todo o tempo êste importante vaso esteja situado tão próximo à direita onde pode fàcilmente ser ligado por engano, com resultados desastrosos.

4. Afim de evitar um engano quanto a localização exata dêste importante vaso (que está à direita), tem-se duas alternativas: (1) abandonar completamente êste nome substituindo-o por "artéria cólica superior direita," "artéria do ângulo hepático do colo" ou "artérie do colo transverso" e (2) nunca usar o têrmo "artéria cólica média" sem acrescentar um dos nomes acima mencionados que indicam sua posição e trajeto de maneira exata e prática.

O nome "artéria cólica média" deve ser mantido apenas para os casos excepcionais nos quais êste vaso realmente existe no centro do mesocolo transverso, circunstâncias nas quais seu uso é justificado.

BIBLIOGRAPHY

Pratique Anatomo-Chirurgicale Illustrée. By F. Paitre, D. Giraud and S. Dupret. Paris: G. Doin et Cie, 1935.

Traité D'Anatomie Humaine. Paris: G. Doin et Cie, 1931. 8th ed., vol. 4.

Anatomy in Surgery. By Philip Thorek. Philadelphia: The J. B. Lippincott Company, 1951.

Atlas of Anatomy. By Sabotta and McMurrich. New York: G. E. Stechert and Co., 1933. 3d ed.

◆

> No man with a genius for legislation has appeared in America. They are rare in the history of the world. There are orators, politicians, and eloquent men, by the thousand; but the speaker has not yet opened his mouth to speak, who is capable of settling the much-vexed questions of the day. We love eloquence for its own sake, and not for any truth which it may utter, or any heroism it may inspire.
>
> —*Thoreau*

Genitourinary Surgery

Adenocarcinoma of the Urinary Bladder

JOHN I. WILLIAMS, M.D.
FORT LAUDERDALE, FLORIDA

M. C. GODWIN, Ph.D., M.D.
HINES, ILLINOIS

AND

ROLAND R. CROSS, JR., M.D.*
CHICAGO, ILLINOIS

THIS study of adenocarcinoma of the urinary bladder was made in an attempt to gain more information on the origin, diagnosis, degree of malignancy and methods of spreading with the hope that this might furnish information useful in determining methods of treatment.

The incidence of adenocarcinoma of the bladder was 1.29 per cent in a large series reported by Dean and Ash. At Hines Hospital, there were 11 such lesions in a total of 981 malignant tumors of the bladder (incidence, 1.12 per cent).

A discussion of the histogenesis of these tumors is an important part of a paper on this subject. Three theories on the origin of these tumors have been advanced by Coppridge and his co-authors; embryonic, anatomic and metaplastic.

In considering the first of these, a brief review of the embryologic picture is in order. The bladder and rectum are both derived from the primitive cloaca, and, as their specific functions become defined, the lining cells of these structures become differentiated into transitional cell epithelium and mucus-secreting columnar epithelium respectively. The apex of the bladder is continuous with the allantois and in the fetus is known as the urachus. In the adult it persists as the middle umbilical ligament. It serves no specific function in the adult. The epithelial cells lining the urachus frequently persist as columnar mucus-secreting cells. Begg, who made the first detailed study of the urachus and urachal tumors, stated that these primitive cells lining the urachus are observed at autopsy in 2 out of 3 cases. Saphir and Kurland observed evidence of these cells in 9 out of 10 cases at autopsy. There has never been definite evidence that nests of these urachal cells ever exist in the bladder mucosa. Tumors of the urachus, for the most part, are adenomas and adenocarcinomas. Strictly speaking, they are not primary in the bladder but may involve it secondarily.

Emmett and McDonald expressed the opinion that, since the rectum and a portion of the bladder have the same primitive anlage, it would not be unreasonable to expect that nests of rectal epithelium will occur in the bladder. Others (Mostofi) are convinced that the bladder epithelium forms both squamous and glandular epithelium by metaplasia. Saphir has recently reported on 2 primary signet cell carcinomas of the bladder similar to those arising in the colon and other organs.

From the Department of Pathology and Urology Section of the Department of Surgery, Veterans Hospital, Hines, Illinois

*Associate, Department of Urology, Northwestern University School of Medicine.

Submitted for publication Jan. 20, 1956.

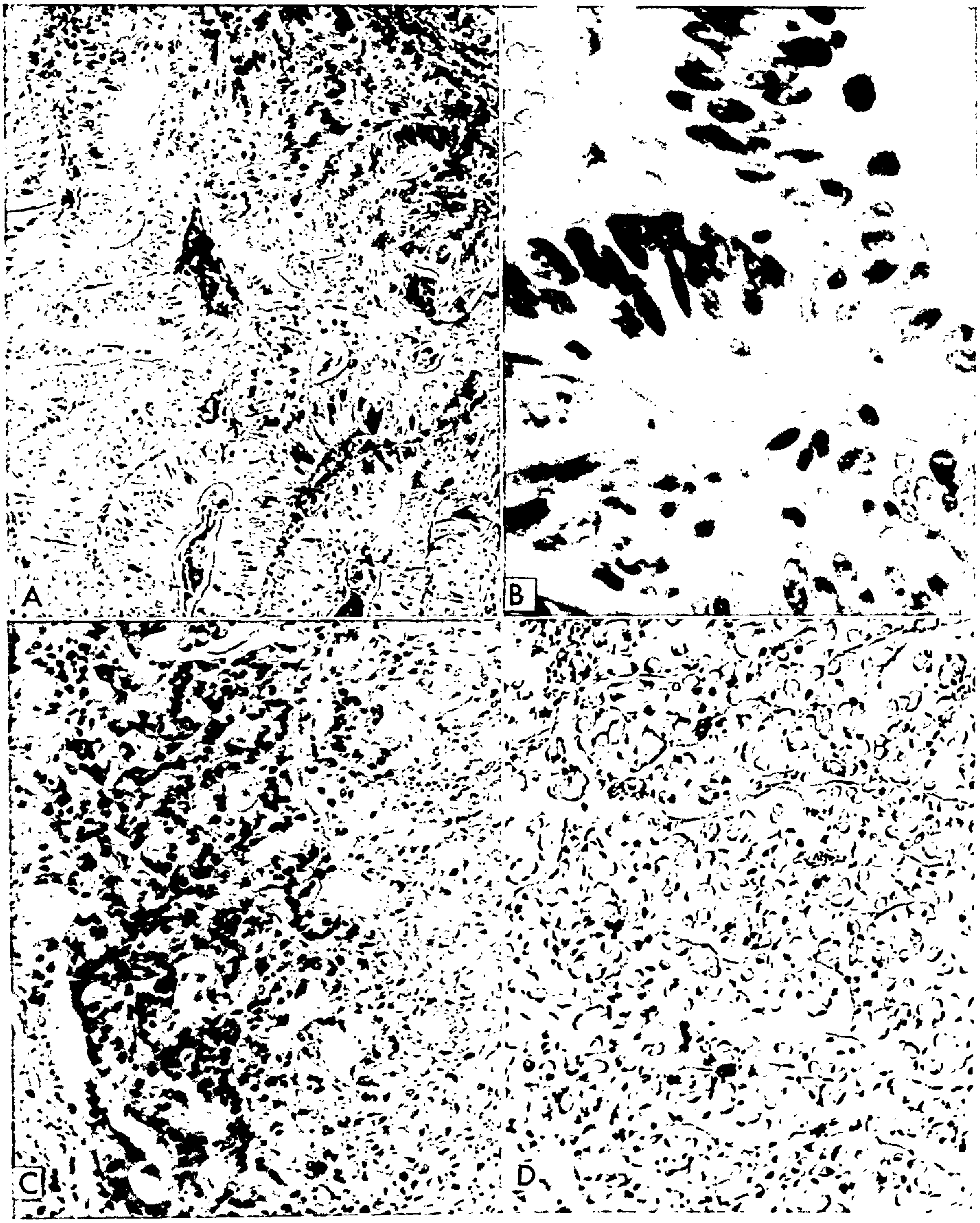


Fig. 1.—*A* (Case 1), biopsy specimen of vesical neck showing adenocarcinoma. Note tall epithelial cells with nuclei at various levels. *B* (Case 1), high-power photomicrograph of same tumor, showing mitotic figures and nuclei at all levels. *C* (Case 2), tissue from vesical neck showing adenocarcinoma with hyperchromatism and nuclear variation. *D* (Case 2), area from tumor shown in *C*. Note diffuse mucinous carcinoma with signet cells.

The anatomic theory is referable to the work of Albarran, who described short tubular glands lined with multilayered epithelium near the bladder neck and trigone. In Albarran's opinion these glands were similar to periurethral and prostatic glands. He attributed some benign and malignant tumors to proliferation of these glands. Albarran further theorized that normal bladder mucosa contained these glands. Since his original work was published, other observers (Sindoni, Enderlen and Formiggini), working with children's bladders, have failed to confirm this theory.

Emmett and McDonald concluded that there were two distinct types of glands: (1) the subtrigonal, periurethral glands, or glands of Albarran, and (2) glands simulating those present in the colon. They demonstrated benign examples of each of these and expressed the opinion that adenocarcinomas might arise from such lesions.

The third theory is that of metaplasia. Von Brunn, in 1893, described hyperplasia of transitional epithelium into buds and papillae forming glandlike crypts. This hyperplasia was usually associated with chronic infection and usually progressed to form cystic structures known as cystitis cystica and cystitis glandularis. Patch and Rhea and, more recently, Mostofi have stated that chronic irritation or infection predispose to metaplasia of the transitional epithelium to form leukoplakia as well as cystitis cystica. Patch and Rhea stated that these conditions are potentially malignant and may form squamous cell carcinoma and adenocarcinoma respectively.

It is interesting that in the majority of the cases of exstrophy of the bladder, when there is a great deal of irritation, there are mucus-secreting cells and that malignant disease develops in 4 per cent of the bladders in such cases. Abeshouse reported that 21 of 27 tumors associated with exstrophy of the bladder were adenocarcinomas, the patients' ages ranging from 23 to 66 years. Coppridge and his co-workers considered this good evidence for the metaplastic theory. On the other hand, Emmett and McDonald expressed the opinion that it may be due to misplaced cloacal entoderm rather than to metaplasia.

The following brief case reviews are presented to correlate the histologic and clinical observations.

REPORT OF CASES

CASE 1.—A 52-year-old Negro, on cystoscopic examination for obstruction, revealed a raised nodular cauliflower-like tumor mass almost completely surrounding the neck of the bladder. A biopsy specimen of the bladder tumor was taken, and transurethral resection of the prostate was done. The diagnosis was adenocarcinoma of the bladder (*A* and *B*, Fig. 1), with a normal prostate. The tumor was a well-defined adenocarcinoma with tall columnar epithelium forming small acini. The nuclei were placed at all levels and were frequently multiple. Many mitotic figures were present. The cytoplasm was reddish and granular. No mucus-secreting cells were observed. There was no marked inflammatory reaction or fibrosis. The prostate was not primarily involved. Proctoscopic examination to a depth of 24 cm. showed no lesions. Later, a left ureterosigmoidostomy was performed. At operation the sigmoid and rectum were examined and no tumor was found. The patient died nine months after his first admission, and an autopsy was performed. The neck of the bladder was completely surrounded by a fungating, polypoid, friable tumor 6 cm. across. There was no involvement of the rectosigmoid. The tumor was invading the bed of the previously resected prostate. The tumor in the bladder wall was histologically similar to the resected specimen. No other tumor was present.

CASE 2.—A 49-year-old porter had a nodular tumor involving the neck of the bladder. A transurethral resection was followed by roentgen irradiation. The diagnosis was adenocarcinoma of the bladder. Definite glandular formations with little su[illegible]ing str[illegible] were observed. There w[illegible] cati[illegible] e

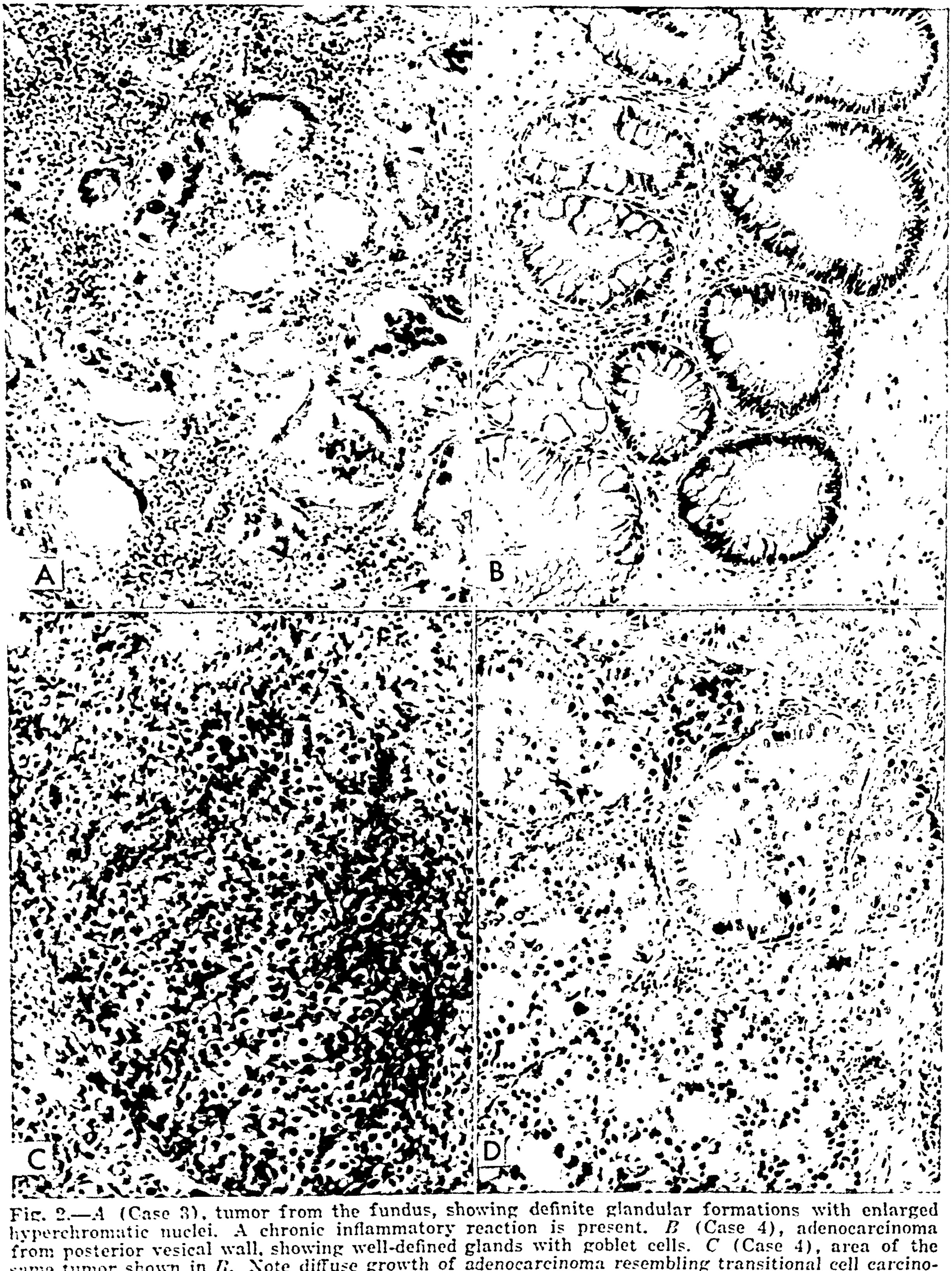


Fig. 2.—*A* (Case 3), tumor from the fundus, showing definite glandular formations with enlarged hyperchromatic nuclei. A chronic inflammatory reaction is present. *B* (Case 4), adenocarcinoma from posterior vesical wall, showing well-defined glands with goblet cells. *C* (Case 4), area of the same tumor shown in *B*. Note *diffuse growth of adenocarcinoma resembling transitional cell carcinoma*. *D* (Case 5), tissue from trigonal area showing definite glands with enlarged hyperchromatic nuclei.

shape and staining quality of the nuclei. Mitoses were frequent. Occasional cells showed mucin formation. There was a diffuse area of mucin-forming cells of the signet type (Fig. 1*D*) continuous with the adenocarcinoma shown in Figure 1*C*. The patient died of pyelonephritis two months after the operation. At autopsy, the tumor was observed only at the vesical neck, with extension into the prostate and seminal vesicles. Special examinations were made of the colon, and no tumor was present.

CASE 3.—A 59-year-old white man had undergone segmental resection elsewhere of a broad-based tumor of the fundus of the bladder. Transurethral resection was done, and the diagnosis was adenocarcinoma. The tumor formed definite glandular formations lined by low cuboidal to low columnar epithelium (Fig. 2*A*). There were no mucous cells. There were large hyperchromatic nuclei. A chronic inflammatory reaction was present in the stroma. There was little increase in fibrous stroma. The patient died of coronary thrombosis six weeks after the operation. No evidence of tumor was observed at autopsy.

CASE 4.—A 51-year-old white man had undergone segmental resection and fulguration of a broad-based tumor, high on the posterior wall of the bladder. The diagnosis was adenocarcinoma (Fig. 2*B*) with areas of diffuse carcinoma (Fig. 2*C*). The adenocarcinoma portion revealed definite glandular formation, with columnar epithelium showing well-defined goblet cells. The cells of the diffuse area had small droplets of mucin in their cytoplasm. The patient died of recurrent tumor of the bladder two and a half years after the operation. No autopsy was performed.

CASE 5.—A 60-year-old white man had two small papillary tumors, which were resected transurethrally from the trigone area, and a prostatic resection was performed. The prostate was reported as showing benign hypertrophy. The two trigone elevations were both well-defined adenocarcinomas (Fig. 2*D*). The cells were columnar, and the nuclei showed hyperchromatism and variations in size and shape. Little desmoplasia was present. The patient was examined recently, fourteen months after the operation, and no tumor was observed.

CASE 6.—A 43-year-old Negro underwent suprapubic fulguration of a hard infiltrating tumor involving the left trigone, the vesical neck and the left vesical wall. The diagnosis was adenocarcinoma. The tumor formed well-defined glands lined with columnar epithelium showing many goblet cells. There were some variations in appearance of different areas of the tumor (Fig. 3, *A* and *B*), as well as variations in the size, shape and orientation of the nuclei. Mitotic figures were numerous (Fig. 3*C*). The tumor was treated by suprapubic fulguration. Cystoscopic examination three years and four months later showed probable recurrence. The patient was killed in an accident four years after his first admission. No autopsy was performed.

CASE 7.—A 57-year-old white man had an ulcerated tumor mass in the left anterior wall of the bladder. He died of uremia two days after admission to the hospital. Autopsy showed a large ulcerated tumor mass in the left anterior wall of the bladder; it had infiltrated the bladder widely, occluding the left ureteral orifice. The tumor had spread along both ureters up to the area of the kidneys, involving the periaortic nodes. There was extension to the pouch of Douglas. The prostate was enlarged. There was no tumor in the rectum or the spine. There were metastases to the lungs and hilar nodes. Microscopic examination showed well-defined glandular formations with little stroma. Modifications in size, shape and staining quality of the nuclei were observed. Abnormal mitotic figures were frequent. There were no goblet cells. In the lung the tumor was intravascular and perivascular, with small pleural nodules.

CASE 8. — A 56-year-old Negro man, a tobacco worker, had a tumor that appeared to involve the entire bladder. The prostate was normal on physical examination. The patient was treated with high voltage roentgen therapy and died sixteen months later. An autopsy was not performed. Death was attributed to adenocarcinoma of the bladder. Microsection showed a well-defined adenocarcinoma with tall columnar epithelium. The nuclei showed marked enlargement, and abnormal mitotic figures were numerous. The cytoplasm was eosinophilic. There were no mucous cells. A marked inflammatory reaction was present. The histologic picture resembled those in other cases of non-mucus-forming tumors.

CASE 9.—A 49-year-old white farmer had a tumor involving the left side of the trigone and the floor of the bladder. It appeared to be a hard, nodular, infiltrating, ulcerated tumor. On physical examination the right base of the prostate was hard, fixed and the size of a walnut. The [illegible]

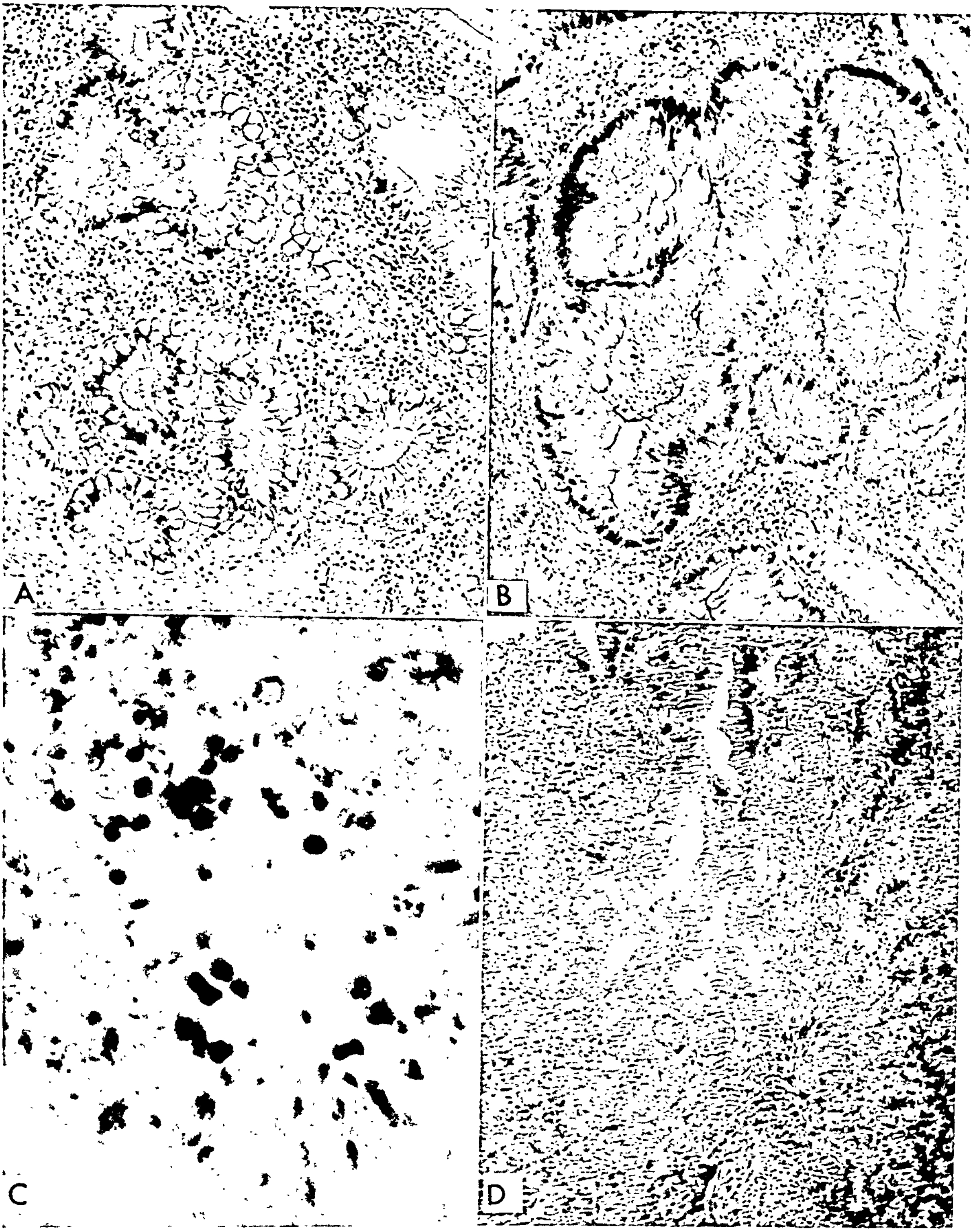


Fig. 3.—*A* (Case 6), adenocarcinoma of trigone, neck and lateral wall of bladder, showing well defined glands with columnar epithelium and goblet cells. *B* (Case 6), different area of tumor shown in *A*. Note mucus-secreting columnar epithelial cells. *C* (Case 6), high power photomicrograph of area near that shown in *B*. Note nuclear changes and numerous mitoses. *D* (Case 11), adenocarcinoma with some areas of diffuse growth. Many cells are forming mucin.

a 2 plus reaction for pus. Suprapubic fulguration and left nephrostomy were performed. The patient died of carcinoma of the bladder nineteen months later. Permission for autopsy was not obtained. Biopsy revealed a well-defined adenocarcinoma with tall columnar cells showing numerous mitotic figures. No goblet cells were present. An acute inflammatory reaction was indicated by the presence of numerous polymorphonuclear leukocytes.

CASE 10.—A 38-year-old white laborer had a large tumor involving the right vesical wall and the right side of the trigone, with isolated tumor nodules on the left wall. Physical examination revealed infiltration of the perivesical tissues, but the prostate was normal. A *suprapubic cystotomy was performed, and the* patient died of hemorrhage three days later. Biopsy showed adenocarcinoma with mucous cells similar to those illustrated in the other cases presented. An autopsy was performed, which revealed adenocarcinoma of the bladder with metastases to periaortic nodes. Bilateral hydronephrosis and right pyelonephritis were present.

CASE 11. — A 54-year-old Negro male, an electrical worker, had a friable papillary tumor involving the internal urethral orifice and the left ureteral orifice. A suprapubic cystotomy and a right ureterosigmoidostomy were performed. No tumor was observed except the one in the bladder. The patient died two months later of uremia, pneumonia and peritonitis. No autopsy was performed. Microsection showed a papillary adenocarcinoma on the internal surface of the bladder with little supporting stroma. In some areas the glands were well defined; there were columnar cells, many of which were secreting mucus (Fig. 3 *D*). Much of the tumor grew diffusely, with no organoid pattern. Mucus-secreting cells, many of the signet ring type, were present. Mitotic figures were common.

COMMENT

A brief statistical analysis of the 11 cases occurring at Hines during the past twenty years revealed the following facts: The primary symptoms were frequency and urgency of urination, with hematuria. The duration of symptoms referable to the lower part of the urinary tract prior to the time diagnosis was established varied from two weeks to five years. In 4 cases the symptoms had lasted more than a year.

The exact location of the original lesion was difficult to ascertain, as several of the patients were seen in late stages of the disease. In 1 case the lesion was in the region of the trigone; in 8 cases it involved the trigone as well as other portions, and in 2 cases it did not involve the trigonal region. Since the regions of the bladder most often afflicted by chronic infection are the trigone and the neck, this would suggest chronic infection as a possible etiologic factor.

The oldest patient in this series at the time the diagnosis was established was 60 and the youngest 38, with an average age of 47 years. The average period of survival was nine months. Autopsies were performed in 5 cases. Only 1 patient was alive and without recurrence fourteen months after transurethral resection and fulguration. No cystectomies were performed. In the majority of cases, treatment consisted of transurethral and suprapubic resection with fulguration. Two patients were given high voltage roentgen therapy in addition and survived two and sixteen months respectively. The discussion as to which mode of treatment was to be used in each case was based on the extent and location of the tumor. High voltage roentgen therapy was given on a palliative basis. Any definite conclusions with regard to treatment are unwarranted in this series of cases, since most of the patients did not live long enough to permit appraisal.

Most of the tumors were described grossly as sessile, broad-based, papillary tumors with ulceration. Of the 5 patients in whose cases autopsy was performed, 2 had generalized metastases; 1 had regional lymph node metastases, and 2 had no metastases. The histologic observations were varied. All of the tumors had acinar structures, but the cells for[illegible]g them varied from the [illegible] r typ[illegible] ca[illegible] to a flat cuboidal type in 1. In 4 cases there were mucus-forming cells; in 7, none. In 1 case there were signet ring mucous cells like those described by Saphir. In 1 case in which there were well defined mucus-forming glands there was also a small area of diffuse growth simulating transitional cell carcinoma (Fig. 7). Saphir and Kurland frequently observed transitional cell carcinoma and adenocarcinoma in the same tumor. The significance of the association of these two types of growth is not clear, but it seems probable that they both arise from the same source. A diffuse type of non-mucus-forming adenocarcinoma might be mistaken for transitional cell carcinoma.

Since the tumors in our series fell into two groups, namely, those with mucus-forming cells and those without, we examined our material to see whether this had any significance. Since others (Albarran, etc.) have suggested that tumors may arise from paraurethral glands in the vesical neck and the trigonal area, we examined our material to see whether one type of tumor was confined to these areas. Our material shows no localization of mucus-forming or non-mucus-forming glands to any anatomic area. This is important since the embryonic origin of the bladder is complicated and might help to explain the origin of adenocarcinomas of the bladder. It is important to recall that adenocarcinoma with mucus-forming cells was observed in the ureter by Jacob and Mau. Such a tumor could not be explained as arising from the large bowel or urachal tissues. It is generally accepted that the allantois does not contribute to the formation of the bladder (Arey). No tumor in our series was connected with the urachus or gave any indication of urachal origin.

The origin of the trigonal area is still uncertain. Some investigators postulate a mesodermal origin from contributions by the mesonephric ducts. Others are convinced that this contribution is only apparent and that the trigone is really entodermal (Arey). The mesonephric duct itself is the renamed pronephric duct formed by fusion of the tips of several of the most cephalad of the pronephric tubules, and, once formed, grows caudad to join the urogenital sinus. Friedman and Kuhlenbeck mentioned tumors of the bladder resembling renal tissue. The appearance of such a tumor might indicate the origin of the trigonal area from pronephric tubules. In 1 of our cases (Fig. 2*A*) the tumor resembled the benign growths illustrated by Friedman and Kuhlenbeck. The tumor here described, however, showed definite malignant change and arose from the fundus of the bladder.

The idea that tumors might arise from paraurethral glands or ectopic prostatic glands in the trigonal area or elsewhere in the vesical wall appears logical. One would expect, however, that carcinoma from ectopic prostate glands would look and behave like prostatic carcinoma by forming bone metastases and causing a characteristically elevated acid phosphatase level. None of the tumors in our cases showed any histologic resemblance to carcinoma of the prostate. For example, the prostate does not form mucinous carcinomas. None formed bone metastases, and there was no elevation of the phosphatase level. In our opinion, therefore, none of them gave any evidence of prostatic origin.

The suggestion, made most recently by Mostofi, that irritation and infection leads to cystitis cystica, to cystitis glandularis and to mucus-forming glands by metaplasia appears to have much in its favor. Our tumors were mostly, but not all, in or near the trigonal area, where infections are most common. In only 1 (Case 11) were there any benign-appearing glands that might be called cystitis glandularis in association with the adenocarinoma, which formed mucus. Whether the association was significant in this or in any other case is problematic. We are convinced, that the association is significant. It might also be stated that the formation of glands probably leads to inflammation, rather than the reverse. That metaplasia can result in squamous cell carcinoma in many glandular organs is unquestioned. The formation of adenocarcinoma with or without mucus formation from transitional epithelium would be unique, but we consider it possible.

It may be that the potentialities of transitional epithelium include the ability to indicate origin from cloacal epithelium, which forms columnar glandular epithelium with mucus secretion in the area that forms the rectum. That many of our tumors imitated carcinoma of the colon was quite evident. Also, all rectal carcinomas do not form mucus.

SUMMARY

Eleven cases of adenocarcinoma of the bladder are reported and discussed. The authors' studies have led them to the opinion that all the tumors in this series arose through metaplasia of the transitional epithelium of the bladder, although the stimulus that gave rise to this process cannot be identified with certainty. The tumors spread by local infiltration and by metastasis to regional nodes, with occasional invasion of the blood vessels. All of them proved highly malignant and difficult to eradicate by any method of treatment. Complications due to involvement of the urethra and the ureteral openings were the usual terminal observations.

SCHLUSSFOLGERUNGEN

Elf Fälle von Adenokarzinom der Harnblase werden dargestellt und erörtert. Die Untersuchungen der Verfasser führen sie zu der Annahme, dass wahrscheinlich sämtliche Adenokarzinome dieser Serie durch Umwandlung des Übergangsepithels der Blase unter einem noch nicht mit Sicherheit erkennbaren Anreiz entstanden sind. Die Ausbreitung der Geschwulst erfolgte durch örtliche Infiltrierung und durch Verschleppung in die regionalen Lymphknoten mit gelegentlichem Eindringen in die Blutbahn. Die Geschwülste waren höchst bösartig und leisteten allen Behandlungsmethoden gegenüber grossen Widerstand. Die im Endstadium beobachteten Komplikationen bestanden gewöhnlich in einer Beteiligung der Harnröhre und der Öffnungen der Harnleiter.

CONCLUSIONI

Vengono presentati e discussi 11 casi di adenocarcinoma della vescica. Gli studi dell'autore hanno portato alla conclusione che gli adenocarcinomi di questa serie probabilmente derivano da una metaplasia dell'epitelio vescicale di transizione, e in conseguenza di stimoli che non possono venire identificati con esattezza. La diffusione avvenne per infiltrazione locale e nelle linfoghiandole regionali, con invasione in qualche caso anche dei vasi sanguigni. I tumori erano molto maligni e difficile da estirpare. Si osservarono complicazioni dovute ad interessamento dell' uretra e del meato uretrale negli stadi più tardivi.

RÉSUMÉ ET CONCLUSIONS

11 cas d'adénocarcinome de la vessie sont présentés et discutés. D'après leurs études les auteurs sont de l'opinion, que touts les adénocarcinomes de cette série sont probablement causés par une metaplasie de l'epithelium transitonel de la vessie sous un stimulant, qu'on ne peut pas identifier proprement. Ces tumeurs s'étendaient par infiltration locale et dans les glandes lymphatiques, quelques fois avec invasion vasculaire. Ils [illegible] t tr [illegible] a-

lignes et difficiles a éradiquer par n'importe quelle methode de traitement. Vers la fin on observait en général des complications par envabissement de l'urèthre et des orifices urétéraux.

BIBLIOGRAPHY

Abeshouse, B. S.: Exstrophy of the Bladder Complicated by Adenocarcinoma of the Bladder and Renal Calculi, J. Urol. 49:259-289, 1943.

Albarran, J.: Les Tumeurs de la Vessie. Paris: Steinheil, 1892, p. 101.

Arey, L. B.: Developmental Anatomy. Philadelphia: The W. B. Saunders Company, 1946. 5th ed.

Begg, R. C.: The Colloid Adenocarcinoma of the Bladder Vault Arising from the Epithelium of the Urachal Canal with a Critical Survey of the Tumors of the Urachus, Brit. J. Surg. 18:422-466, 1931.

Begg, R. C.: Colloid Tumor of Urachus Invading the Bladder, Brit. J. Surg. 27:769, 1936.

Von Brunn, A.: Ueber Drusenaehnliche Bildungen in der Schleimhaut des Nierenbeckens, des Ureters und der Harnblase beim Menschen, Arch. f. Mikr. Anat. 41:294-303, 1893.

Coppridge, W. M.; Roberts, L. C., and Culp, D. A.: Glandular Tumors of the Bladder, J. Urol. 65:540-549, 1951.

Dean, A. L., and Ash, J. E.: Study of the Bladder Tumors in the Registry of the AUA, J. Urol. 63:618-624, 1950.

Emmett, J. L., and McDonald, J. R.: Proliferation of the Glands of the Urinary Bladder Simulating Malignant Neoplasm, J. Urol. 48:257, 1942.

Enderlen, E.: Zur Histologie der Schleimhaut dtr Ektopierten Blase, Verhand. d. Deutsch. Path. Gesellsch. 7:167-170, 1904.

Formiggini, B.: Contributo Allo Studio Della Mucosa Vesicale Extrofica, Riforma Med. 36:252, 1920.

Friedman, N. B., and Kuhlenbeck, H.: Adenomatoid Tumors of the Bladder Reproducing Renal Structures (Neophrogenic Adenomas), J. Urol. 64:657-670, 1950.

Jacob, N. H. Jr., and Mau, W.: Metaplasia of Ureteral Epithelium Resulting in Intestinal Mucosa and Adenocarcinomatous Transfusions: Report of Two Cases, J. Urol. 65:20-24, 1951.

Mostofi, F. K.: Potentialities of Bladder Epithelium, J. Urol. 71:705-714, 1954.

Patch, F. S.: Epithelial Metaplasia of the Urinary Tract, J.A.M.A. 136:824, 1948.

Patch, F. S., and Rhea, L. J.: The Genesis and Development of Brunn's Nests and Their Relation to Cystitis Cystica, Cystitis Glandularis and Primary Adenocarcinoma of Bladder, Canadian M. A. J. 33:597-606, 1935.

Saphir, O.: Signet Ring Cell Carcinoma of Bladder, Am. J. Path. 31:223-231, 1955.

Saphir, O. and Kurland, S. K.: Adenocarcinoma of the Urinary Bladder, Urol. & Cutan. Rev. 43: 709-719, 1939.

Sindoni, M.: Origin of Vesical Glandules and Their Relation to Tumors of Glandular Structures, Arch. Ital. di. Urol. 10:309, 1933.

◆

In order that all men be taught to speak truth, it is necessary that all likewise should learn to hear it; for no species of falsehood is more frequent than flattery, to which the coward is betrayed by fear, the dependent by interest, and the friend by tenderness. Those who are neither servile nor timorous are yet desirous to bestow pleasure: and while unjust demands for praise continue to be made, there will always be some whom hope, fear or kindness will dispose to pay them.

—*Johnson*

Radical Perineal Prostatectomy in the Treatment of Prostatic Carcinoma

H. HAYNES BAIRD, M.D., F.A.C.S., F.I.C.S.
CHARLOTTE, NORTH CAROLINA

A PERMANENT cure for cancer of the prostate can be accomplished only by early total prostatectomy. Why, then, is this procedure not recommended by a greater number of urologists? Chute[1] has answered this question as far as the perineal approach is concerned: "Although radical perineal prostatectomy in early cases has produced results superior to those of other methods, the operation has never been popular owing to the major complications that sometimes accompany its use." As to the statistics on radical perineal prostatectomy, I refer the reader to Jewett's article[2] in the *Journal of the American Medical Association,* which covers the largest series of cases up to the time of writing.

The complications of radical perineal prostatectomy that are feared by every urologist are incontinence of urine and rectourethral fistulas. Steps that have enabled my colleagues and me to avoid these complications in about 125 cases of simple perineal prostatectomy and 15 cases of radical prostatectomy will be outlined. Some may ask why mention is made of the cases in which operation was performed for adenoma. The steps to prevent the aforementioned complications are essentially the same in the two types of perineal prostatectomy, with one exception, which will be mentioned later. The steps to be outlined are taken to enable the surgeon to leave the external urinary sphincter, the perineal muscles and the rectum in a condition similar to their preoperative state (Fig. 1).

Steps to prevent incontinence of urine and the formation of rectourethral fistulas are as follows:

1. After the cutaneous incision has been

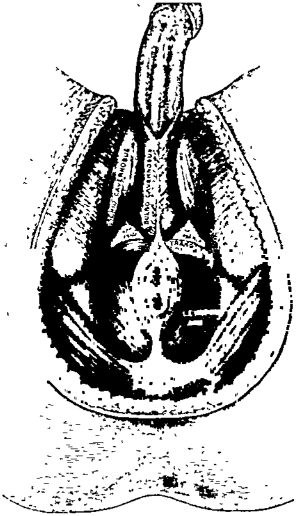


Fig. 1.—Drawing from *Gray's Anatomy,* p. 428, showing normal structures of the perineum.

Read at the Twentieth Annual Congress of the United States and Canadian Sections, International College of Surgeons, Philadelphia, Sept. 12-15, 1955.
Submitted for publication Nov. 3, 1955.

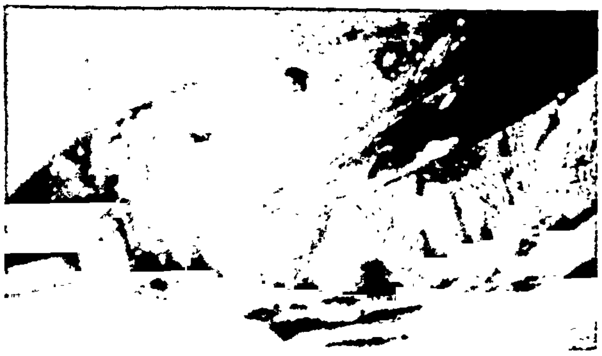


Fig. 2.—Rectum identified on either side of the central tendons.

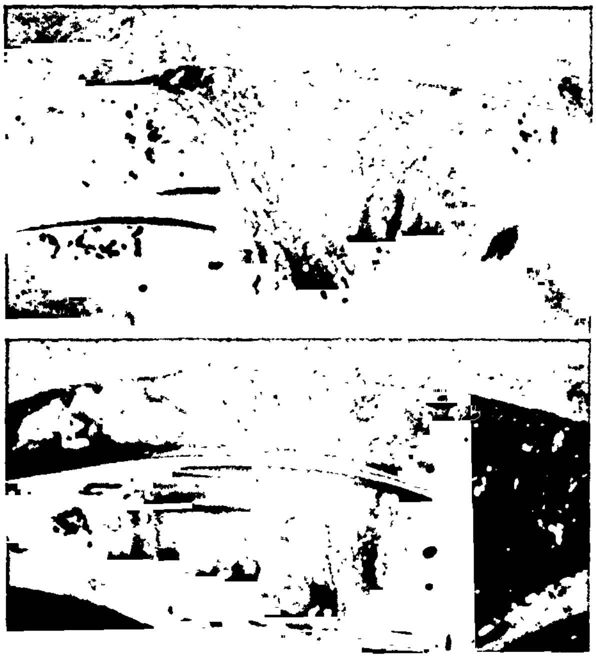


Fig. 3. — Surgeon's index finger behind central tendon, which is cut with scissors.

made, the rectum is identified on either side of the central tendons as shown in Figure 2.

2. The central tendon is cut, thus exposing the rectum (Fig. 3, *top*).

3. The left index finger is inserted into the rectum and the left thumb into the wound, and the rectum is exposed by blunt dissection to the so-called rectourethralis muscle (Fig. 3, *bottom*).

4. This muscle is cut as illustrated in Figure 4. It is highly important to cut only this muscle, which in reality is the fibrous sheath that unites the two levator ani muscles. If the levator ani muscles are cut to any extent at this point, incontinence of urine may occur. The rectum can now be separated by blunt dissection from the prostate and seminal vesicles, and the left index finger is removed from the rectum.

5. Removal of the prostate and seminal vesicles can now be carried out in a routine manner. Just before the prostate gland is cut off at the neck of the bladder, the anterior part of the neck should be freely mobilized so that it can be brought down and anastomosed to the membranous portion of the urethra without tension on the suture line. If there is any question about tension on the suture line, tension sutures should be put through the neck of the bladder and brought out through the perineum, as advocated by Vest. Unless a mucosa-to-mucosa anastomosis without tension is obtained at this point a ring of scar tissue may form, which would predispose to incontinence of urine.

6. By bringing the levator ani muscles together and suturing the bulb to the anterior angle between the levator ani muscles as shown in Dr. Hayes' illustration (Fig. 5) the function of the external urinary sphincter is greatly enhanced. This step is routine in radical perineal prostatectomy and in simple perineal prostatectomy

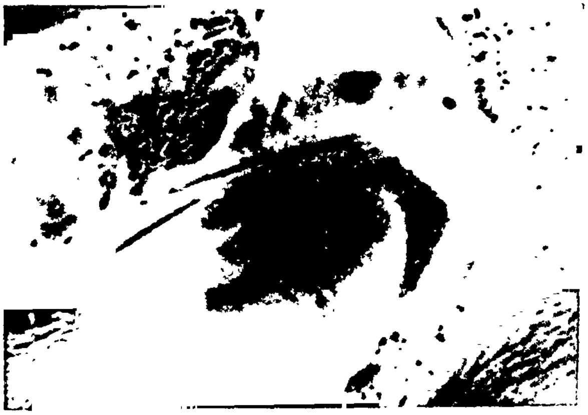


Fig. 4.—Cutting of rectourethralis muscle. Index finger of surgeon's right hand is in the rectum and the right thumb for traction in the incision.

when the adenoma is large. In fact, I used it in all types of perineal prostatectomy until about two years ago. Hayes[3] recently published an article on incontinence of urine in the male, in which this step was described and illustrated; perfect results were obtained in 10 out of 15 patients operated upon.

In addition to the aforementioned steps, three points about radical perineal prostatectomy in general should be mentioned:

First, if the surgeon fears the use of a finger in the rectum during the operation because of possible contamination of the wound, neomycin can be given preoperatively.

Second, an open perineal biopsy should be done and the biopsy site fulgurated to prevent implantation, as has been reported to follow needle biopsy. A "rush section" examination of this tissue, rather than a "frozen section" examination, should be done, since the latter can be erroneous with regard to prostatic tissue. If biopsy reveals cancer, a radical perineal prostatectomy can be done within twenty-four hours after the biopsy.

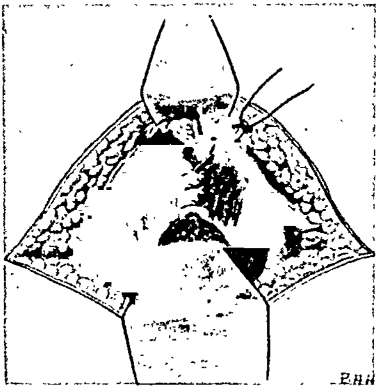


Fig. 5—*Illustration from Dr. B. A. Hayes' article in the Southern Medical Journal*, 1955, showing the method used by Keys for approximating the levator ani muscle.

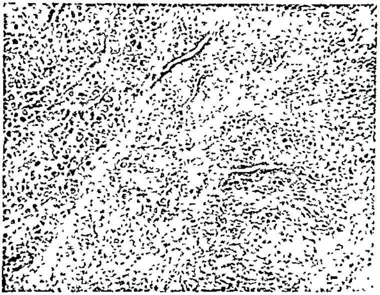


Fig. 6. — Section showing carcinoma in skeletal muscle (external urinary sphincter), was removed by radical perineal prostatectomy without any postoperative incontinence of urine.

Third, a No. 18 F Robinson catheter should be used. It should be removed on the third or fourth postoperative day.

Fourth, radical perineal prostatectomy can be performed when the neoplasm is not confined to the prostate and permanent cure is not expected.

The following case will illustrate: A 57-year-old man* gave a history of increasing symptoms of prostatism for three and one-half years prior to admission to the hospital, with 125 cc. of residual urine. On rectal examination there was no suspicion of carcinoma, so a transurethral resection was done. Microscopic examination revealed infiltrating carcinoma of all the tissue removed. For eight days after the operation the patient ran a septic course, with the temperature elevated to 103 F. Since the prostate was movable, a radical perineal prostatectomy was done ten days after the transurethral resection. For two days after radical removal of the prostate the temperature was elevated to 100.4 F.; it was normal thereafter. Microscopic examination of the specimen revealed infiltrating carcinoma throughout the prostate, seminal vesicles and periprostatic fibrofatty tissue and skeletal muscle (Fig. 6). The urethral catheter was removed on the third postoperative day. Urine drained through the perineal wound for two days, so a No. 16 F urethral catheter was inserted and left in place for two days. The patient remained in the hospital for twelve days after the radical perineal prostatectomy and never had any incontinence of urine.

---

*This patient was operated upon by Dr. Dexter R. Amend, Senior Resident in Urology at the Charlotte Memorial Hospital, Charlotte, North Carolina.

COMMENT

The postoperative course following transurethral resection is much more stormy than that following radical perineal prostatectomy. Even though this patient is not cured of prostatic carcinoma, he will not have to be readmitted to the hospital for repeated transurethral resections, which is a common occurrence following other palliative procedures for this disease.

SUMMARY

It is generally agreed that total removal of the prostate and seminal vesicles is the only chance for a cure in cases of early cancer of the prostate, and in the author's opinion radical perineal prostatectomy has not been utilized to any great extent because incontinence of urine and rectourethral fistulas have complicated matters too often in the past. Steps to prevent these complications are outlined.

ZUSAMMENFASSUNG

Es wird allgemein anerkannt, dass die völlige Resektion der Prostata und der Samenbläschen die einzige Chance zur Heilung von Prostatakrebsen im Anfangsstadium darstellt. Nach Ansicht des Verfassers ist die radikale perineale Resektion der Prostata nicht sehr häufig angewendent worden, weil bisher der Verlust der Harnkontrolle und Fistelbildungen zwischen dem Mastdarm und der Harnröhre allzu häufige Komplikationen waren. Es werden Wege beschrieben, um solche Komplikationen zu umgehen.

RIASSUNTO

Si è generalmente d'accordo sul fatto che l'unica possibilità nella cura del cancro primitivo della prostata sia la rimozione totale di essa e delle vescicole seminali e secondo l'autore la prostatectomia perineale radicale non si pratica largamente a causa della incontinenza urinaria e delle fistole rectouretrali che in passato complicarono così spesso tale intervento. Vengono dati dei suggerimenti per prevenire tali complicazioni.

RÉSUMÉ

L'accord général est, que l'excision totale de la prostate et des vesicules séminales est la seule chance de cure dans les cas d'un cancer précoce de la prostate, et dans l'opinion de l'auteur la prostatectomie radicale périnéale n'a jamais été très populaire, parce que l'incontinence d'urine et les fistules recto-uréthrales ont compliqué l'opération trop souvent jusqu'à présent. Des mesures pour éviter ces complications sont expliquées.

REFERENCES

1. Chute, R.: Radical Retropubic Prostatectomy for Cancer, J. Urol. 55:347-372, 1954.
2. Jewett, H. J.: Radical Perineal Prostatectomy for Cancer, J.A.M.A. 156:1039-1041, 1954.
3. Hayes, B. A.: Control of Urinary Incontinence in the Male, Southern M. J. 48:234-238, 1955.

Neurologic Surgery

Relief of Pain by Transorbital Electrocoagulation of the Frontal Lobes[*]

E. E. HERZBERGER, M.D., F.I.C.S.[**]
AND
J. BRAHAM, M.C., M.D., M.R.C.P.[†]
TEL HASHOMER, ISRAEL

SURGICAL procedures carried out on the frontal lobes are in many cases effective not only in influencing emotional responses and behavior in mentally disturbed patients but in altering the reaction to painful disease in persons of normal mentality. Nevertheless, since conventional psychosurgical methods are usually followed by serious deterioration of the total personality, intervention of this sort is recommended with considerable hesitation. Understandably, lack of desire to confront the relatives with a possibly unrecognizable caricature of a formerly well-known person, must temper the natural wish to relieve suffering. In the case of painful incurable malignant disease this unhappy choice is posed in its most harrowing form.

A considerable advance in this field came with the recent recognition that surgical lesions in the frontal lobe of much more limited extent than those generally resulting from operations on psychotic patients were still capable of evoking the desired response when carried out for the alleviation of pain. In particular, the effectiveness of lesions in the medial lower quadrants of the frontal lobe has been demonstrated (Pool, 1954; Grantham, 1951). Grantham has succeeded in placing lesions in this area by an electrocoagulation technic in which electrodes are introduced through burr-holes in the cranial vault in front of the coronal suture.

Patients treated in this way no longer complained of pain, yet the essential elements of personality and intellect were preserved.

Many such patients, as a result of the original illness together with the combined effects of prolonged severe pain and massive doses of analgesics, are in very poor physical condition. Even this operation may appear to be a difficult undertaking for such a patient. Hence, with a view to inflicting upon the patient the least possible disturbance, a transorbital coagulation technic (Herzberger, 1955) was evolved for the purpose of placing limited lesions in the approximate vicinity of the aforementioned zones. This communication discusses the effects of this operation in 8 patients, the indication in every case being severe intractable pain due to malignant disease.

Technic.—Pentothal sodium anesthesia

---

[*] Based on a communication delivered before the Third National Neuropsychiatric Congress, Jerusalem, Oct. 11-13, 1955.

[**] Surgeon-in-Charge, Department of Neurology, Tel Hashomer Government Hospital, Tel Hashomer.

[†] Physician-in-Charge, Department of Neurology.

Submitted for publication Feb. 12, 1956.

is employed. The upper eyelid is pinched between thumb and finger and brought well away from the eyeball. A sharp, short-pointed trocar (diameter about 5 mm.) is inserted then into the conjunctival sac, care being taken not to touch the skin or the lashes; the point is moved around until it settles against the roof of the orbit. The point of the instrument (and only the point) is pushed through the roof of the orbit, which is usually thin in this area, with gentle rotating movements; there is seldom need of a mallet. Once the point has gone through, the handle of the trocar is slightly elevated and rotated laterally to right and left to enlarge the hole in the orbital vault and allow a smooth passage for the lobotome; the hole thus having been made, the trocar is taken out and the lobotome inserted into the same place, The latter instrument is the usual transorbital lobotome, insulated with rubber or plastic covering except for the last centimeter of its tip. A small white plastic ring marks a point 7 cm. from the tip. The lobotome is introduced parallel with the bony ridge of the nose and slightly toward the midline [as in Freeman's transorbital lobotomy] (Fig. 1 *A*). When the 7 cm. mark is reached, the handle of the lobotome is strongly elevated until the shaft of the instrument lies more or less parallel with the orbital plate, as in one of the final steps of Freeman's operation (Fig. 1 *B*). A coagulating current (intensity 4 of the Bircher electrosurgical unit) is applied to the lobotome for about one minute. The lobotome is then withdrawn and the procedure repeated on the other side.

Certain evidence that coagulation has been produced is the presence of small carbonized brain fragments adherent to the noninsulated tip of the lobotome. When, owing to insufficient intensity of electric current, no coagulation is produced, the tip of the lobotome remains smooth, with a thin covering film of fresh blood.

The average time needed for a bilateral operation is four minutes.

Pathologic Picture. — In the cadaver, the lesion produced by electrocoagulation was situated within the lateral part of the lower medial frontal quadrant, involving also the most medial part of the lateral lower quadrant. The length of the cylindric coagulum was about 1 cm. and its width about 12 to 15 mm. The lobotome, of course, on introduction and rotation,

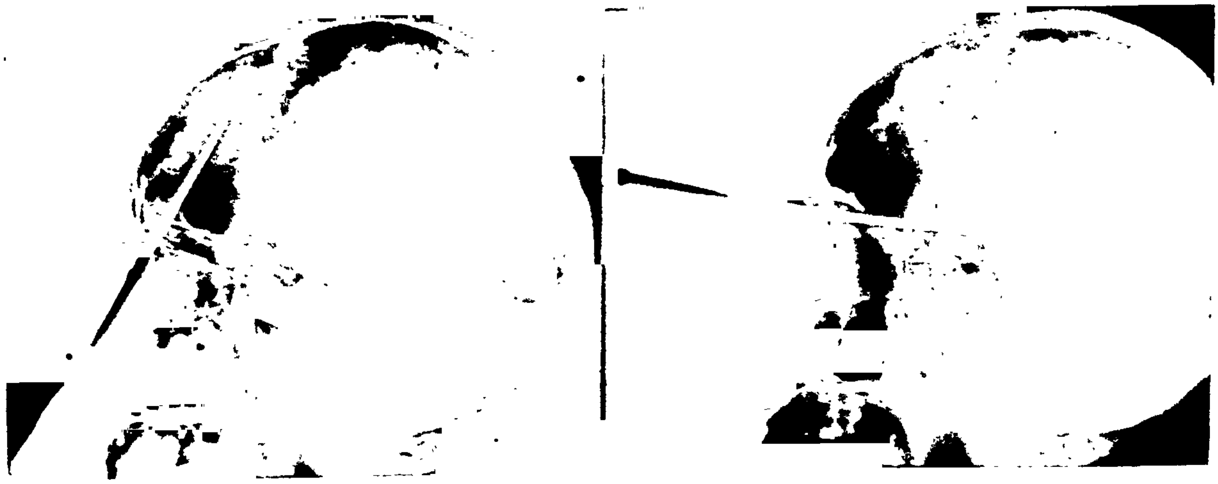


Fig. 1.—*A*, position of lobotome after introduction through orbital plate. *B*, position of lobotome after vertical rotation: it is in this position that electrocoagulation is performed.

causes an additional small lesion within the medial upper frontal quadrant.

In the living subject one must probably take into account the effects of additional vascular thrombosis causing possibly a somewhat larger area of destruction. Of *the 3 patients in this series who eventually* succumbed to their original illness, permission for post-mortem studies was obtained *only in 1 instance.* Section of the brain in this case (death occurred two months after the operation) showed an area of softening following electrocoagulation, some 15 to 25 mm. wide and 20 mm. long, situated almost centrally but involving the lower quadrants more than the upper quadrants. The lesion was of unequal size on the two sides (Fig. 2).

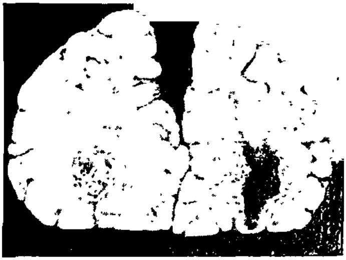


Fig. 2. — Coronal section through frontal lobes, showing extent of lesion produced by electrocoagulation, in right half specimen, coagulum has fallen out.

It should be stressed, however, that in this case it was incidentally necessary to use a *coagulating current of intensity 6,* because of local transient variations in the electric power supply. Postoperative apathy, plus incontinence lasting four or five days, constituted more severe disturbances than usual. Neither was observed in the other cases, in which a weaker current (4) was employed. Our feeling is that a larger lesion than usual was inadvertently produced in this case.

Clinical Results. — The operation has been performed on 8 patients from May 1954 to the time of writing. All of these had intractable pain due to malignant disease with metastases and before operation were being given enormous and increasing doses of analgesics, usually morphine. In its primary objective of relieving suffering, the procedure seems to have been uniformly successful. Whenever possible the patient was returned to the care of the referring department after the first few postoperative days. In these circumstances it was hoped to obtain an unbiased assessment; in fact, the changed situation was quite clear. In all cases pain was no longer spontaneously complained of, and this expressed itself most strikingly in the complete cessation of the patients' demands for pain-relieving drugs. At the same time, in response to a leading question, *the existence of pain was often* admitted, but in an indifferent way, or, as one referring physician described it, as if a third person were under discussion. Independence of analgesics continued up to death from the basic illness in 3 patients (two, four and seven months after operation respectfully). The evident lack of suffering was appreciated by members of the family and of the hospital staff.

Postoperative intellectual deterioration was not noted, and it was possible for the patients to carry on intelligent conversation at the preoperative level. Alteration in emotional tone was usual, though not invariable, at the beginning, tending to be much less evident after a week or two. Incontinence appeared in only 1 case and did not persist for more than a few days.

No patients died as a result of the procedure, and no aphasia or paralytic phenomena appeared.

COMMENT

It is not proposed to deal at length here with [illegible] wider [illegible]tions of the results of various lobotomy technics, concerning which a voluminous literature already exists. It is of interest, however, to reaffirm that postoperatively, in these patients, ordinary appreciation of painful and other stimuli was quite unaffected; pinprick, for example, was recognized and accurately located as before. Apparently the pathophysiologic effects of the lesion are within the realm of the integration of pain as a psychic experience; this result is also common after the more extensive lobotomies.

With regard to the exact location and extent of the lesion produced by this procedure, a precise forecast cannot be made in each case. There must be a good deal of variation, depending on the remoter effects of vascular thrombosis. Judging by the lack of postoperative neurologic deficits, it may be assumed that the lesion is fairly well limited to the operative site.

As our introductory remarks indicate, we hoped to cause partial destruction in the inferior medial quadrant, and so to reproduce the desired clinical results as obtained by other workers using a somewhat more elaborate approach. In fact, in the single case in which there was opportunity for postmortem control, damage seemed to be restricted to the antral-medial portion of the lower half of the frontal lobe, rather than to the inferior medial quadrant. In spite of this, the clinical outcome seemed entirely adequate; one may permissibly speculate that in this part of the brain, at least as far as behavior responses to pain are concerned, the limited spatial extent of the lesion is a factor of more importance than is its precise anatomic location.

Blind transorbital lobotomy technics tend to be frowned upon as dangerous, though Freeman (1950) has emphasized the fact that the mortality rate is far lower than that of formal open operations. As has been mentioned, no untoward results complicated the 8 cases of this series: as against its theoretical drawback it may be emphasized that the operation described is extremely simple and rapid, being completed in a few minutes, and does not require a complicated instrumentarium or even on operating theater.

SUMMARY

Lesions restricted to the lower medial portions of the frontal lobes are known to be able to reduce suffering from otherwise intractable pain.

By the use of a technic of closed transorbital electrocoagulation a somewhat more centrally placed lesion can be produced in the lower half of the lobe. This operation has been performed without operative mortality on 8 cachectic patients with severe pain due to inoperable metastasizing malignant disease.

Alleviation of suffering was obtained in each case without gross alterations in intellect or personality. In practice, these results seem similar to those reported as following the placing of lesions in the inferome dial quadrant.

Authors' Note: Our thanks are due to Dr. Pade and other physicians and surgeons of the Tel-Hashomer Hospital and the Hadassah Hospital Tel-Aviv, who referred patients for operation and undertook the postoperative observation.

ZUSAMMENFASSUNG

Schädiguengen des Stirnlappens des Gehirns, die sich auf die unteren medialen Abschnitte beschränken, können bekanntlich zur Verminderung heftiger Schmerzen, die sonst auf keine Behandlung ansprechen, führen.

Durch Anwendung einer Technik der geschlossenen transorbitalen Elektrokoagulation lässt sich eine etwas mehr zentral gelegene Schädigung in der unteren Hälfte des Stirnlappens hervorrufen. Diese Operation wurde an acht kachek-

tischen Kranken mit heftigen auf inoperablen metastatischen Krebserkrankungen beruhenden Schmerzen ausgeführt, ohne dass es zu einem Todesfall als Folge des Eingriffs kam.

In allen Fällen wurde eine Erleichterung der Schmerzen ohne starke Veränderungen des Intellekts oder der Persönlichkeit erzielt. Diese Erfolge sind praktisch ähnlich denen, die nach der Setzung von Schädigungen im unteren medialen Quadranten berichtet wurden.

RÉSUMÉ

On sait, que par des lésions restreintes aux parties médiales inférieures des lobes frontaux on peut calmer des douleurs réfractaires à touts les autres traitements.

En se servant d'une techniques d'électrocoagulation transorbitale fermée, on peut produire une lésion plus centrale dans la partie inférieure du lobe. Cette opération a été exécutée sans mortalité opératoire à 8 patients cachectiques, qui souffraient de douleurs sévères, causées de metastases d'une maladie maligne.

L'alléviation de la souffrance fut obtenue dans touts les cas sans grande altération de l'intelligence ou personalité. En pratique ces résultats ressemblent à ceux qui sont reportés suivant les lésions produites dans le quart médial, inférieur.

RIASSUNTO

Si sa che lesioni limitate della porzione mediale inferiore del lobo frontale possono ridurre la sofferenza di dolori altrimenti intrattabili. Usando una tecnica di elettrocoagulazione transorbitale chiusa si può produrre nella metà inferiore del lobo una lesione situata un po' più centralmente. Questa operazione è stata eseguita, senza mortalità operatoria, in 8 pazienti cachettici con fortissimi dolori dati da metastasi maligne ed inoperabili. In ciascun caso si alleviò il dolore senza che ne risentisse l'intelligenza o la personalità. In pratica questi risultati appaiono uguali a quelli in cui la lesione si pratica nel quadrante infero-mediale.

REFERENCES

Freeman, W., and Watts, J. W.: Psychosurgery, Oxford: Blackwell Scientific Publications, 1950. 2n ed., p. 598.

Grantham, E. G.: J. Neurosurg. 8:405, 1951.

Herzberger, E. E.: Harefuah 49:177, 1955.

Pool, J. L.: In Clinical Neurosurgery: Proceedings of the Congress of Neurological Surgeons, New Orleans, La. Panel discussion on psychosurgery. Baltimore: The William and Wilkins Company, 1955, p. 201.

◆

> If appeasing our enemies is not the answer, neither is hating them. . . . Somewhere between the extremes of appeasement and hate there is a place for courage and strength to express themselves in magnanimity and charity, and this is the place we must find.
>
> —*Griswold*

The Use of Reserpine in Neurologic Surgery

SAMUEL ROSNER, M.D., F.I.C.S.

BRONX, NEW YORK

RESERPINE, as serpasil,* has been used by me in 30 cases of varied neurologic conditions treated by surgical intervention. The purpose of this study was to evaluate the status of reserpine as an aid in diminishing the morbidity of the neurosurgical postoperative state.

Stephen, Bourgeois-Gavardin and Martin came to the conclusion that reserpine had no effect as a preanesthetic agent. Their patients needed the usual amount of anesthetics, and postoperative narcotics were needed in the usual amounts.

Plummer and others suggested that the probable site of action of reserpine is the hypothalamos. Since hyperthermia and the depressant action of sedation are two of the problems that confront the neurosurgeon, it was decided that reserpine may be a possible aid in neurosurgical procedures.

Seven cases illustrative of the use of reserpine are briefly described.

REPORT OF CASES

CASE 1.—A man aged 54 years was admitted to the hospital *in status epilepticus*. He was completely confused between attacks. Left-sided craniotomy revealed a venous angioma which was coagulated. Postoperatively, as soon as the patient could swallow, he was given serpasil, 25 mg. three times daily. He was no longer violent; after the third dose he rested peacefully and had no further convulsions. While in the hospital he was given serpasil, 0.25 mg. four times daily, with dilantin sodium, 0.1 Gm., also three times daily.

The postoperative rise in temperature was never above 102 F., and no narcotics were needed for relief of pain.

CASE 2.—A white woman aged 31 underwent a right craniotomy, with evacuation of a subdural clot. This patient was nervous and apprehensive. She was given serpasil, 0.25 mg. three times daily, before the operation and for about four days thereafter. She reacted well after the anesthesia. The postoperative rise in temperature was easily controlled, and it was the distinct impression that the need for postoperative analgesics and sedatives was diminished.

CASE 3.—G. G. C., a white girl aged 3½ years, underwent left-sided craniotomy with coagulation of a cerebral venous angioma. This child was given serpasil, 9.1 mg., three times daily. The temperature was easily controlled, and analgesics and sedatives were needed in minimal amounts.

CASE 4.—W. S., a young white man, underwent laminectomy for a herniated lumbosacral intervertebral disc. Because of pain, the patient had become addicted to morphine derivatives. He was given serpasil, 25 mg., four times daily, for two days before the operation and for one week in the hospital after the operation. Narcotics were needed in minimal doses for the first three postoperative days and were not given thereafter. The patient left the hospital ten days later, no longer addicted to narcotics. Serpasil, 0.1 mg. four times daily, was given for two weeks after his discharge.

CASE 5.—M. A., a man aged 40, a Puerto Rican, underwent a second laminectomy at the level of the fourth and fifth lumbar interspaces for removal of arachnoid adhesions and a herniated intervertebral disc. The man was apprehensive and in severe pain before the operation. He was given serpasil, 0.1 mg., four times daily for two weeks prior to the operation and for about one week after the operation. He was out of bed on the third day after the operation, needed very little postoperative analgesic medication and was no longer apprehensive.

CASE 6.—M. G., a white woman aged 53, underwent left-sided craniotomy for removal of a metastatic melanoma from the frontoparietal region. She was confused before the

---

*The drug used in this study (serpasil) was supplied by Ciba Pharmaceutical Products, Inc.

Submitted for publication Jan. 28, 1956.

operation. Serpasil, 0.25 mg., was given three times daily for two days before the operation. The patient reacted promptly after the operation. She was given postoperative serpasil, 0.1 mg., four times daily for about four days. She became more lucid after the operation; the rise in temperature was easily controlled, and sedatives and analgesics were rarely needed.

CASE 7.—J. H., a white man aged 46, underwent removal of the left cerebellar hemisphere for metastatic carcinoma. He had been operated upon for this condition in another hospital two years earlier. At that time only a biopsy specimen was taken. Serpasil, 0.1 mg., was given four times daily for two days preoperatively and for four days postoperatively. The patient reacted promptly after the operation. Cerebration was adequate. The rise in temperature was easily controlled. Analgesics and sedatives were rarely needed. The patient was comfortable, ate well and carried on conversations with his visitors. He died suddenly on the fifth postoperative day. Permission for necropsy was not granted.

SUMMARY AND CONCLUSIONS

The foregoing reports exemplify the types of patients in whose cases serpasil was used both preoperatively and postoperatively. The author's conclusions are based on experience in about 30 cases in which serpasil was used.

Serpasil has definite value in controlling postoperative hyperthermia following cerebral operations. It diminishes the need for analgesics and sedatives both before and after surgical intervention. It has definite value as an aid in reducing the postanesthetic reaction time. Hypotension does not contraindicate its use.

Since the author instituted the preoperative and postoperative use of serpasil, he no longer uses any of the narcotics either before or after the operation. Preoperative medication consists of nembutal, 0.2 Gm., and atropine, 0.5 mg. If the patient is restless and apprehensive, nembutal may occasionally be needed in the postoperative period. Sodium luminal, 260 mg., is given intramuscularly three times daily. This potentiates the action of serpasil in patients who are extremely restless and difficult to control.

The author has found serpasil decidedly valuable in the handling of neurosurgical conditions and now uses it routinely for all his patients, including children.

RÉSUMÉ

Sept cas sont reportés, ou le Serpasil fut donné préet postopératoirement. Les conclusions de l'auteur sont basées sur les experiences dans presque touts les cas, ou le Serpasil était donné.

Serpasil est de valeur définie en contrôlant l'Hyperthermie dans les procédures cérébrales. Cela diminue la nécessité d'analgésiques et sedatives dans la période préoperatoire et postopératoire. Il est de valeur definie en reduisant la période de réaction postanesthétique. L'hypotension n'est pas une contraindication pour l'usage de la réserpine.

Depuis qu'il a commencé de donner de Serpasil dans le traitement pré- et postopératoire, l'auteur ne donne plus du tout aucun narcotique.

La médication préoperatoire consiste en Nembutal 0.2 Gm. et de l'atropine 0.5 Mgm. Si le malade est inquiet et sensible, il faut lui donner quelques fois du Nembutal après l'opération. Du Sodium Luminal 250 mg. est donné par injection intramusculaire trois fois par jour. Cela augmente l'action du Serpasil chez les malades, qui sont extrèmement inquiets et difficiles a contrôler.

L'auteur a trouvé le Serpasil valable dans les conditions neurochirurgicales et il s'en sert maintenant régulièrement pour touts ses patients, inclu les enfants.

ZUSAMMENFASSUNG

Es wird über sieben Fälle berichtet, bei denen vor und nach der Operation Serpasil verwendet wurde. Die Schlussfolgerungen des Verfassers stützen sich auf

Erfahrungen, die an etwa 30 mit Serpasil behandelten Fällen gewonnen wurden.

Serpasil ist von deutlichem Wert in der Kontrollierung postoperativer Temperaturerhöhungen in der Gehirnchirurgie. Es setzt den Bedarf an schmerzstillenden und beruhigenden Mitteln vor und nach der Operation herab. Es bewährt sich sicherlich zur Verkürzung der Reaktionsperiode nach der Narkose. Absinken des Blutdrucks stellt keine Kontraindikation zur Anwendung von Reserpin dar.

Seitdem der Verfasser die prä- und postoperative Anwendung von Serpasil eingeführt hat, benützt er keine Narkotika mehr vor oder nach dem chriurgischen Eingriff. Die Arzneimittelverabreichung vor der Operation besteht aus 0.2 Gm Nembutal und 0.5 mg Atropin. Gelegentlich kann die Anwendung von Nembutal nach der Operation notwendig sein, wenn der Patient unruhig und ängstlich ist. 260 mg Luminalnatrium werden dreimal am Tage intramuskulär verabreicht. Dadurch wird bei Kranken, die äusserst unruhig und schwer zu kontrollieren sind, die Wirkung des Serpasils erhöht.

Der Verfasser hält das Serpasil für wertvoll in der Behandlung chirurgischer Erkrankungen des Nervensystems und verwendet es routinenässig bei allen seinen Kranken einschliesslich von Kindern.

RIASSUNTO

Vengono riportati 7 casi in cui si usò il serpasil tanto prima che dopo l'operazione. Le conclusioni dell'autore si basano sulle esperienze ottenute in circa 30 casi. Il serpasil è di indiscusso valore nel controllare l'ipertermia post-operatoria negli interventi sul cervello. Diminuisce tanto prima che dopo la operazione la necessità di somministrare analgesici. E' di indiscusso valore nel ridurre il tempo di reazione post-anestesia. L'ipotensione non è una controindicazione all'uso della reserpina. Da quando ha instituito l'uso del serpasil tanto pre- che post-operatoriamente, l'autore non adopera più narcotici. Il medicamento pre-operatorio è rappresentato dal nembutal, 0,2 Gm., e dall'atropina, 0,5 Gm. Qualora il paziente sia in uno stato di agitazione e ansieta il nembutal può essere necessario dopo l'operazione. Il luminal sodio, 260 mg., è dato 3 volte al giorno per via intramuscolare. Ciò potenzia l'azione del serpasil nei pazienti che siano estremamente agitati e difficili da tenere sotto controllo. L'autore ha trovato che il serpasil è molto efficiente in neurochirurgia ed ora lo usa di routine per tutti i suoi pazienti, compresi i bambini.

BIBLIOGRAPHY

Stephen, C. R.; Bourgeois-Gavardin, M., and Martin, R. C.: Preoperative and Postoperative Sedation with Reserpine, Ann. New York Acad. Sci. 61:236-249, 1955.

Plummer, A. J. A.; Earl, J. A.; Schneider, J., and Barrett, W.: Pharmacology of Rauwolfia Alkaloids, Including Reserpine, Ann. New York Acad. Sci. 59:8-21, 1954.

◆

Obstetric and Gynecologic Surgery

Use and Abuse of Oxytoxics in Obstetrics

ROY V. BOEDEKER, M.D.
ST. LOUIS, MISSOURI

THE discussion of this broad topic naturally resolves itself into an outline of three main uses of oxytoxics in obstetrics: (1) to control postpartum hemorrhage from atony; (2) to stimulate contractions in the presence of uterine inertia, and (3) to induce labor.

The purpose of this paper is to offer a brief review of the uses and abuses in the light of present-day knowledge.

Postpartum Atonic Hemorrhage. — I know of no crisis in the obstetrical care of patients sadder than the sudden collapse of a healthy new mother as her life's blood copiously drains away with a sickening splash as the attendant stands helplessly by or exhausts himself with useless massage and repeated packings. The diagnosis is quickly made from the objective evidence of much blood, a soft uterus distended with clots and the absence of any signs of traumatic injury to the birth canal. It should be expected in cases of uterine hyperdistention, fibroids, prolonged labors, in patients more than para 4 and following placenta praevia, abruptio placenta, adherent placenta or deep anesthesia. It can be avoided by never attempting the violent expression of a placenta before separation has occurred. Atonic hemorrhage has given rise to the concept of the fourth stage, or immediate portpartum period, which many attendants habitually neglect—to the detriment of mortality statistics from hemorrhage, the leading cause of maternal death.

Either ergonovine or methergine is an efficient oxytoxic agent for the routine prophylactic use made necessary by current technics of analgesia and anesthesia. It is injected intravenously on delivery of the shoulders, and, since timing is important in the prevention of incarceration of the placenta, the shoulders and trunk of the baby are delivered very slowly.

Once the diagnosis of atonia is made, an intravenous infusion of 1:1,000 pitocin in 5 per cent dextrose in water is started and crossmatching of blood ordered. While one awaits the uterine response, its cavity is investigated manually for retained cotyledons and firm pressure made over the fundus with the "abdominal hand" in order to anteflex the uterus over the vaginal fist in the relaxed lower segment. This and blood replacement are all that need to be done. I have not resorted to tamponade in several years and have become dramatically convinced of its ineffectiveness by demonstrating on many occasions that simply removing a previously placed pack is all that is necessary to prevent a delayed recurrence of hemorrhage. Packing and repacking a uterus that remains refractory delays the needed hysterectomy until the collapse from blood loss is irreversible.

Prolonged Labor of the Inertia Type.—At about the time I was introduced to the science of midwifery, ob[illegible] assailed with fearful [illegible]

Read at the Nineteenth Annual Congress of the United States and Canadian Sections, International College of Surgeons, Chicago, Sept. 6-10, 1954.
Submitted for publication Dec. 15, 1954.

authorities with regard to the hazards of using any oxytoxic during the first and second stages of labor. Although the practice is now generally accepted and favored, the dangers still exist when these agents are indiscriminately used (or abused) by unqualified personnel in poorly staffed or poorly equipped hospitals. Tragic results are inevitable if these drugs are used for patients haphazardly selected and without proper attention during their administration.

Nevertheless, the need for a safe oxytoxic in cases of prolonged labor with uterine inertia existed until 1949, when Hellmann showed that pitocin in dilute solution, administered by careful intravenous drip, obviated many of the dangers and enhanced its effectiveness. Using a tokodynomometer with leads from the fundus, the midsegment and the lower segment of the uterus, he showed a gradient of decreasing uterine activity from the fundus to the lower uterine segment in normal labor. Fundal dominance is reversed in the presence of uterine inertia and is further aggravated by the improper use of oxytoxics, which causes squeezing of the fetus to the point of endangering its life. This reversed effect is greatest with the first dose of pitocin given intramuscularly and disappears as repeated small doses are given at frequent intervals. Administration of the diluted drug intravenously, therefore, was the obvious method of maintaining a normal physiologic gradient of uterine activity when the need of stimulation arose.

The need of stimulation does not exist in a neglected patient who is dehydrated and exhausted. The first consideration here is the administration of parenteral fluids and nourishment, with heavy sedation. My choice is 15 mg. of morphine; this usually provides three to four hours of rest, during which a reevaluation of the causes of the prolonged labor is done. In the presence of borderline disproportion or malposition, roentgen pelvimetry is ordered, and a decision is made whether to proceed with a trial of labor. After the period of rest the diluted pitocin drip is started, with the obstetrician in constant attendance. This may be needed only rarely; if primary inertia is the sole cause of the prolonged labor, the patient in most cases will deliver after resting.

I begin with 500 cc. of 5 per cent dextrose in water and set the flow at a rate of 25 drops per minute before adding 0.5 cc. of pitocin. If the solution is mixed before the infusion is started, too large a dose of pitocin may be given before the rate of flow can be adjusted. Since some uteri are particularly sensitive to oxytoxics and the resulting tetany may cause anoxemia of the fetus or rupture of the uterus, the physician must remain in attendance and ether must be kept close at hand. The main safety factor in this method, however, is controllability. Rate of flow is adjusted according to reaction, and, because excretion is prompt, discontinuation of the flow quickly ends the action of the drug. There should be no orders left for a nurse to set a certain number of drops per minute while the doctor hurries on his way.

I have developed such confidence in this method that I frequently resort to its use in supplementing weak labor pains before exhaustion demands the rest period with morphine. I still maintain, however, a profound respect for the power packed in this drug and never use it for a patient with a distended uterus (twins, or hydramnios) or a woman of high parity. In my opinion, many more women with borderline disproportions will deliver vaginally if given a trial of labor with intravenous pitocin. Its continued use is safe as long as progress is maintained and the condition of the mother and fetus carefully supervised. To prolong its use in the presence of a constriction ring or cervical dystocia is an abuse. After delivery, the infusion is continued well into the fourth stage, to prevent postpartum atonic hemorrhage.

Induction of Labor.—Without elaborating on the indications, once the termination of pregnancy is decided upon, the intravenous administration of pitocin is a dependable method in 95 per cent of cases in which there is a soft cervix with effacement and 1 to 2 cm. of dilatation. Close regard for these prerequisites, plus amniotomy after regular contractions have started, will increase the successful induction rate to nearly 100 per cent. When the aforementioned prerequisites do not exist, e.g., when the patient is a primipara with a long closed cervix and an unengaged fetal head, the use of any oxytoxic is an abuse, and such a pregnancy should be terminated by cesarean section. (I have not been able to duplicate the series of Tamis and Shey, who successfully induced labor in patients without regard to the criteria of favorability by repeated infusions of diluted pitocin with daily rest periods.) Neither should one ignore the old contraindications of the use of an oxytoxic in cases of breech presentation, after a previous cesarean section or in the presence of twins with overdistention. Its use in cases of toxemia, however, is recommended, since there is no significant effect on the blood pressure.

My standard procedure is the same as described for inertia uteri; I use 500 cc. of 5 per cent dextrose in water and add 0.5 cc. of pitocin to the flask after the rate of flow has been adjusted. The physician remains in attendance then, controlling the flow according to response. Should a tetanic contraction occur or uterine incoordination result in fetal anoxemia as evidenced by changes in the fetal heart rate, the drug is discontinued at once. This situation rarely occurs and represents one of the reasons I have discarded the use of intramuscular pitocin, which not infrequently causes such crises. For the same reason, I never use ergot preparations, quinine or intranasal pituitrin in the induction of labor.

No discussion of inducing labor is complete without a word about so-called "elective" inductions.

Some patients come from rural communities not served by a hospital. Many multiparae dread being delivered *en route* because they have had previous short labors. Some are distinctly uncomfortable as the confinement date passes and are continuously nagged by painful contractions and pressure pains. If favorable conditions exist, there is no reason why these patients should be denied the convenience of an induced labor. The physician must always resist the temptation to recommend an elective induction for his own convenience or to end family or patient pressure just because the estimated date of delivery has arrived. It is difficult to justify an elective induction of labor in a primipara or because of alleged postmaturity. I am aware of the dangers of allowing a patient to remain undelivered after the forty-third week, but in my opinion term time is better estimated by vaginal examination than by calendar-counting. If the cervix is long and closed, the patient is not at term. If it is partially effaced and dilated and the estimated size of the fetus is approaching 9 pounds (3,629 Gm.), I induce labor.

In the '30's elective inductions were fashionable, and it was considered smart to set the baby's birthday during the first office visit for prenatal care. Likewise, busy obstetricians felt more efficient if they could line up the week's work and deliver them all in one day by induction. This is an unthinkable abuse, as demonstrated by the fact that this hospital had a 10 per cent induction rate in 1937 and only a 50 per cent rate of success. Last year the induction rate was 2.8 per cent, and 80 per cent of inductions were successful. So far has obstetric common sense progressed.

In general, I may say that intravenous dilute pitocin is, in my opinion, the modern oxytoxic because when intelligently used, its action is more physiologic and more readily controllable than is that of others. Statistically it is safer and more effective.

SUMMARY

The author discusses the extent to which oxytoxic drugs can be used in obstetric practice and the methods of using them that fall within the limits of safety. His opinions are based on both observation and experience. Of the various oxytoxics, he considers pitocin in dilute solution, administered in a gentle intravenous drip, the preparation of choice, since its action more nearly approaches the physiologic norm than does that of any other oxytoxic and is also easier to control.

ZUSAMMENFASSUNG

Der Verfasser erörtert die Frage, in welchem Umfang sich wehenanregende Mittel in der geburtshilflichen Praxis anwenden lassen, und welche Verfahren innerhalb der Grenzen der Sicherheit liegen. Er begründet seine Ansicht auf persönlicher Beobachtung und Erfahrung. Er hält die vorsichtige tropfenweise intravenöse Verabreichung einer verdünnten Lösung von Pitocin für das Verfahren der Wahl, weil auf diese Weise eine nahezu physiologische Wirkung wie mit keinem anderen wehenerregenden Mittel erreicht wird, und weil sich die Dosierung leichter kontrollieren lässt.

RIASSUNTO

L'autore discute i casi in cui si devono usare i farmaci ocitocici in ostetricia ed i metodi per non uscire dai limiti di sicurezza. Le sue opinioni sono basate tanto sull'osservazione che sulla esperienza. Fra gli ocitocici egli considera quale farmaco di elezione la pitocina in soluzione diluita e somministrata endovena a gocce e questo perchè la sua azione si avvicina di più a quella fisiologica di qualsiasi altro ocitocico ed è anche più facile da controllare.

RÉSUMÉ

L'auteur discute les limitations des médicaments oxytoxiques dans la pratique obstétricale et les méthodes de leur usage dans les limites de sécurité. Son opinion est basé sur observation et expérience. Il considère la Pitocine, donnée en solution diluée, précaucieusement, par goutte intraveneuse, d'être la préparation de choix, puisque son action ressemble mieux à l'action physiologique que n'importe quelle autre oxytoxique, et que c'est plus facile de la contrôler.

> It is with books as with men. a very small number play a great part: the rest are confounded with the multiple.
>
> —*Voltaire*

Stress Incontinence of Urine in Women: Physiologic Treatment

ARNOLD H. KEGEL, M.D., F.A.C.S., F.I.C.S.

LOS ANGELES, CALIFORNIA

THE physiologic or nonsurgical treatment of stress incontinence of urine has been widely adopted during the past seven years. Clinicians who employ muscle education and resistive exercise successfully in the management of this complaint have come to recognize several basic factors that have heretofore been overlooked.

1. Physiologic disturbances are more important in the causation of stress incontinence than are childbirth injuries.
2. Muscular dysfunction is primary; failing fascial support is secondary.
3. The bladder is the holding organ; the urethra, as in the male, is the emptying canal. Control of urine depends on neuromuscular function in the region of the vesical outlet—only to a limited degree on the status of the tissues surrounding the urethra.
4. The pubococcygeus is the key muscle of the female pelvis, contributing to supportive, sphincteric and sexual functions and to the tone of various striated and smooth muscles.

These physiologic principles are the basis of the nonoperative treatment of stress incontinence; they have been described in earlier papers and have proved of great practical value.

The changing trend in the treatment of stress incontinence has focused attention on various etiologic factors. At the same time, several reasons for failure with both surgical and nonsurgical therapy have become apparent, and new vistas have been opened in the field of obstetrics, gynecology and urology.

During the period in which the physiologic treatment of stress incontinence was being developed—prior to the publication of the first series of papers[1]—mainly cases of simple, uncomplicated stress incontinence were studied. At that time it was possible to report successful results in 86 per cent of patients. During the past several years a marked change has taken place in the type of cases referred to the Perineometer Clinic at Los Angeles County General Hospital and encountered in private practice. Many physicians are successfully employing physiologic therapy in cases of simple stress incontinence, referring only complicated conditions to specialists. The same changing trend is particularly noted by surgeons: in cases of simple involvement the need for operative correction has been practically eliminated; in the presence of complications they find it necessary to resort to ever more radical technics.

Whenever favorable results are reported in complicated cases, they are being obtained against almost impossible odds. This situation is likely to become more accentuated as the years go by. During the next decade, physicians will be increasingly able to recognize the prodromal signs of urinary stress incontinence. Thus the condition will be treated during its earliest stages, and the far-advanced condition may become a medical rarity. In the present state of transition two sets of problems command special attention and

---

Read at the Twentieth Annual Congress of the United States and Canadian Sections, International College of Surgeons, Philadelphia, Sept. 12-15, 1955.
Submitted for publication Sept. 19, 1955.

will be briefly summarized: first, the etiologic background of urinary stress incontinence and the recognition of its earliest symptoms, and, second, its management in both simple and complicated cases.

Etiologic Factors.—In the past, trauma has been considered the primary cause of stress incontinence. This erroneous conclusion was reached for the simple reason that severe stress incontinence is a disease of adult women, practically all of whom have borne children. In a series of 455 cases from the Perineometer Clinic at Los Angeles Hospital, however, I have observed stress incontinence in 65 women in whom obstetric trauma could be definitely excluded as a factor: 54 were nulliparous, 6 were virgins and the children of 5 had been delivered by cesarean section. As trauma, therefore, is far from being the sole cause of stress incontinence, I began to take more detailed histories of parous women. It was observed that 195 had symptoms of weakness of the bladder long before their first pregnancy. Thus the trauma of childbirth was only an incident superimposed upon a lifelong dysfunction. The symptoms of disturbances of the bladder during childhood and adolescence included bedwetting beyond the age of 5; poor urinary control; particularly embarrassing degrees of urgency and frequency, and occasional loss of urine. The incidence of such weaknesses is probably much higher than my statistics indicate; many women are inclined to make light of childhood accidents, attributing them to faulty habits, nervous traits or familial tendencies. My observations are substantiated by those of Nemir and Middleton,[2] who, in a survey of 1,327 nulliparous students, mainly between 17 and 21 years of age, reported that 52.4 per cent admitted some degree of stress incontinence; 5 per cent experienced frequent loss of urine; only 47.6 per cent were entirely free of bladder weakness.

Considering the high incidence of mild disturbances of the urinary tract in young women, it may seem surprising that frank stress incontinence is not more commonly encountered. Many of these women somehow learn to improve control. Others, however, throughout adult life, have marginal symptoms of neuromuscular dysfunction, manifested by degrees of urgency, frequency, nocturia, and prolapse of the perineum, bladder and uterus, as well as sexual complaints. Women in general take these borderline handicaps for granted and endure them as long as possible; the condition is mentioned to the physician only when the dysfunction begins to interfere with the patient's activities.

The value of a detailed history of all patients with a urinary complaint cannot be overemphasized. In fact, it is possible to make a diagnosis of the purely physiologic type of urinary stress incontinence and genital relaxation on the basis of the history alone. Ninety-five per cent of all patients with stress incontinence fall into this category, and these are the patients who will respond most readily to physiologic therapy.

Types of Stress Incontinence.—Among the cases encountered at the Perineometer Clinic at Los Angeles County General Hospital and in private practice, a distinction is made between moderate and severe degrees of physiologic stress incontinence and another type in which injury has been superimposed upon the moderate or severe degree of physiologic stress incontinence. In a third type the physiologic disturbance plays a minor role and incontinence is due mainly to systemic factors, particularly neurologic, metabolic or degenerative processes.

The moderate degree of physiologic urinary stress incontinence is characterized by partial voluntary control of micturition. Physiologic management was originally designed for the treatment of this type. Improvement is obtained promptly, on the average within two to eight weeks, and a complete and permanent cure may be expected in nearly 100 per cent of cases. Failure to achieve permanent success raises the question whether the treatment has been carried out correctly.

In this common type of stress incontinence the patient is able to hold her urine quite well, especially when she is not fatigued, and as a rule she can reach the toilet in time to prevent loss of urine. This indicates that the tissues at the bladder outlet are anatomically intact and that a fair degree of residual neuromuscular function is present.

Patients with more severe physiologic stress incontinence depend on pads to absorb the urine, and these pads are wet most of the time. Very little voluntary control of micturition remains. Therapy is prolonged and requires meticulous cooperation. Patients will obtain relief only if instructions are accurate and repeated many times, until they are thoroughly understood. In spite of the effort required, the treatment of choice is physiologic rather than surgical. Physiologic therapy does not add trauma to poor function, nor does it aggravate the condition, as surgical repair may do.

Moderate as well as severe physiologic incontinence may be complicated by injury superimposed on the lifelong dysfunction. Such injuries are caused by childbirth or by pelvic operations. As a rule, obstetric injuries are limited to a portion of the pubococcygeus muscle and do not involve fibers in the region of the vesical outlet. On the other hand, surgical procedures may destroy large segments of the pubococcygeus, and deep scars in the anterior portion of the vagina distort the anatomic relation of bladder and urethra. Among the patients observed at the Perineometer Clinic of Los Angeles County General Hospital, urinary stress incontinence was preceded in 223 cases, or 49.01 per cent of the series, by one or more pelvic operations performed for the correction of genital relaxation and stress incontinence. Injuries severe enough to interfere with function of the pubococcygeus were demonstrated in 122 patients.

The management is essentially the same for all three types of physiologic stress incontinence, whether moderate, severe or complicated by injuries. The only difference is that in cases of severe involvement and cases in which injury has occurred physiologic therapy must be more intensive and extend over a longer period. Often it is necessary to reinstruct the patient again and again for many months before a successful result can be obtained. In such cases the prognosis depends upon several factors, the most important of which is the patient's ability to make the best use of whatever function and intact tissue remain.

Physiologic Therapy of Stress Incontinence.—The objective of physiologic treatment of stress incontinence is to train the patient in the use of the special group of muscles concerned with control of micturition. Once a reflex pattern has been established, as it exists in normal women, function becomes self-perpetuating and recurrences are rare. The muscles that control micturition are closely related to the pubococcygeus, the functions of which have only recently been discovered. Fortunately, this highly versatile muscle is accessible to digital examination and to specific therapy consisting of muscle education and resistive exercise.

The difference between *specific exercises,* designed to restore the function of a muscle or a muscle group, and haphazard general exercises is well understood by "muscle physiologists." Obstetricians, gynecologists and urologists have had little opportunity to appreciate ue of specific exercise therapy of muscles. The pubococcygeus is an intrapelvic skeletal muscle hidden from view. Specific treatment of this muscle, therefore, is different from the usual physiotherapy. The old haphazard perineal exercises used by midwives and still recommended by some physicians may accidentally or partially reach the pubococcygeus, thus accounting for uncertain and temporary results. The wide difference between haphazard general exercises of the perineum and specific therapy of the pubococcygeus muscle is emphasized because there continues a tendency on the part of many physicians to take the path of least resistance, thereby obscuring the essential issue. It has been my experience that most of the failures in the physiologic treatment of urinary stress incontinence are due to the fact that the pubococcygeus has been ignored.

The importance of the pubococcygeus in urinary control is recognized in the more physiologic types of operation recently developed for the relief of stress incontinence. Ingelman-Sundberg[3] and Trahey and Pacey[4] have stressed the necessity for plicating the medial fibers of the pubococcygeus at the level of the vesical neck. They have obtained excellent results. Obviously, the structures at the level of the vesical outlet are far more important for restoration of control than those of the urethra, which is nothing more than an outlet, as in the male.

Technic. — The essentials of specific physiologic therapy of stress incontinence are:

1. Identification of the pubococcygeus by digital palpation.
2. Instruction of the patient in exercises of the pubococcygeus, designed to develop its supportive and sphincteric functions.
3. Correct contractions. These are always more important than strong contractions; this is pointed out to every patient.
4. Continuation of therapy well beyond the disappearance of symptoms, until the conditioned reflex of control is firmly established, as it exists in normal women.

The pubococcygeus is identified with the tip of the index finger 1 cm. above the introitus, or immediately inside the rami of the os pubis. The condition of the muscle is best determined by palpation with one finger; the use of two fingers distorts the muscular portion of the vagina, and a speculum hides it completely. Normally the surface of the pubococcygeus is smooth, and the muscle is at least 2 fingerbreadths wide on either side of the snug, long vaginal canal. In this state the muscle holds urethra and bladder firmly in a high anterior position. It is capable of strong contractions, equivalent to 20 to 60 mm. of mercury, as measured with the perineometer.

In patients complaining of stress incontinence the pubococcygeus muscle is usually narrow and retracted; the middle third of the vagina is roomy, and its walls are redundant. It is especially noted that the tissues between the anterior vaginal wall and the vesical neck are thin and sagging, and the tone is poor. Contractions of the pubococcygeus are weak, slow or absent, as traced with the palpating finger and measured with the perineometer. Efforts to contract the muscle usually do not raise the urethral meatus or the tissues in the region of the vesical neck. If the patient has a history of childbirth or of a previous operation it is important to examine the muscle on both sides for evidence of unilateral or bilateral injury. At the same time other signs of relaxation of the genital muscles, such as moderate sagging of the perineum, prolapse of the uterus, and cystocele, are observed, for they are also closely related to dysfunction of the pubococcygeus muscle.

The next step is to inform the patient that the muscles concerned in the control of micturition are weak because she did not learn to use them properly in childhood, and that restoration of control depends on accurate and diligent exercises. With the palpating finger on the pubococcygeus, the physician asks her to contract, and each time the muscle tightens, she is told that her efforts are correct. After the right contractions have been repeated several times the vaginal chamber of the perineometer is inserted, and the patient can then observe the results of her efforts by watching the dial of the manometer.

The method that produces the quickest, surest and most lasting results combines exercises with the perineometer and exercises without it. The patient is instructed to practice contractions with the aid of the instrument for twenty minutes three times daily. It is explained that exercises against the increasing resistance provided by the apparatus are necessary to develop the reserve strength of the muscles, so that no loss of urine will occur with the added strain of coughing, laughing, etc. The more she repeats these contractions, with and without the perineometer, the sooner will she establish a new habit pattern.

I give my patients the following detailed instructions for exercises without the additional apparatus:

1. Before arising in the morning, contract the muscles five times, as demonstrated with the perineometer; then contract them again five times on first standing up; try to hold the muscles in a contracted position while walking to the toilet.

2. Interrupt the urinary stream several times during each voiding.

3. Repeat contractions of the same muscles five times every half hour throughout the day. (It is brought to the patient's attention that permitting the muscles to sag for long periods retards progress and that to "bear down" during exercises may aggravate her complaints.)

The early morning exercises are especially important, for the patient begins the day with the perineum in a high position, whereas previously she started out with a sagging pelvic floor and considered the associated tired feeling normal. Because so many of my patients complain of losing urine late in the day, I have come to regard stress incontinence as part of a *pelvic fatigue syndrome* that must be relieved if one is to obtain permanent results. With adequate exercises the woman learns to maintain the perineum in a higher position and enjoys a sense of pelvic strength, which, by many, is appreciated as much as the relief of incontinence. Those who attain this new pelvic comfort continue the exercises with confidence and enthusiasm.

When the patient is reexamined after three to six weeks of diligent exercises with and without the perineometer, it will be observed that much of the slack in the supportive muscles has been taken up; the perineum, bladder and uterus have assumed a higher position, and the vagina is longer and tighter; at the same time the strength of contractions has increased several millimeters of mercury. If, however, no changes are noted, reevaluation of all factors becomes necessary. The patient is reinstructed, and the essential points are repeated and emphasized.

During reexamination it is made certain again that the patient is exercising the pubococcygeus and not extraneous muscles, such as those of the abdomen or gluteal regions and the more superficial muscles of the urogenital diaphragm. The most frequent cause of failure is letting the patient exercise week after week without ascertaining whether she is activating the pubococcygeus. Faulty contractions are most likely to come to light when the physician has his palpating finger on the various segments of the pubococcygeus muscle, while the patie eats xercises exactly as she did them at home. The patient is also asked to demonstrate how she exercises with the perineometer.

Like many other physicians, I have tried short cuts in this routine, but the results have not been as satisfactory or nearly as reliable; the response is disappointing in more than 50 per cent of cases. If the patient has made progress, and even if the control of urine has become excellent, she is instructed to continue exercises with and without the perineometer for several months, to improve the entire pelvic musculature as much as possible.

Whenever a patient has not made satisfactory progress, I reinstruct her in the exercises and ask her to return at regular intervals; many, therefore, have been under observation over a period of years. Surgical correction is often taken into consideration but usually not advised. Most such patients have already undergone one or more operations which failed to bring relief or even aggravated the incontinence; furthermore, the tissues in the region of the vesical outlet are of such poor quality that plastic repair has little chance of success.

Factors Complicating Therapy. — During the past seven years every patient referred to the Perineometer Clinic for study of incontinence has been given a therapeutic test consisting of muscle education and resistive exercise. This routine is followed even when anatomic changes or complications are present which hitherto have been considered hopeless or amenable only to surgical correction.

Close observation of many hundreds of patients, extending over months and years, has revealed several new aspects of stress incontinence. It was most surprising to note that patients with symptoms dating from childhood were much easier to cure than those with a history of sudden onset during adult life, in whose cases symptoms did not begin until after obstetric or surgical injury or in the course of systemic disease.

The principal complication in patients with symptoms since childhood is that they have adopted an attitude of resignation and skepticism. To be successful, medical management of stress incontinence must go far beyond treatment of the local condition. It is most valuable to understand that these women have many related problems and have suffered great disappointments. Their social life has been disrupted by embarrassing incidents —enuresis, wetting of clothes, uncontrollable urgency and the odor of urine. Some state that they have remained virgins or unmarried on this account. Among those who are married, sexual problems and domestic discord are common. Usually pregnancy and childbirth is more troublesome and exhausting than in a normal woman. Nearly all have chronic pelvic fatigue and some degree of genital prolapse. Recurring cystitis and nocturia often disturb their rest, especially after middle age. As a group, they have had much more than their share of urogenital therapy, yet obtained only temporary relief. Friends and husbands may have criticized them for their "negativism," but the physician may admire these women for their courage and fortitude. They not only endure their handicap in silence but seek to compensate for it through hard work, devotion to home and conscientious motherhood. Initially they are inclined to look with an air of hopelessness upon so simple a form of therapy as muscle education and resistive exercise.

In essence, they need more understanding and encouragement than does the average patient. The proof that the foregoing factors are important in the physiologic management of this condition is the fact that as soon as these women note even slight improvement of control, their personalities undergo favorable changes and they follow instructions diligently and with enthusiasm.

Local factors also require a new evaluation. In the past, therapy was almost entirely concentrated on the urethra and the surrounding tissues. It is now known that this organ plays only a minor role in stress incontinence. It makes little difference whether the urethra is long or short, large or small, mobile or fixed, or whether urethrocele, moderate strictures or small diverticula are present. These conditions do not in themselves affect the control of urine or complicate physiologic therapy. In many of my patients the urethra had previously been treated without relief of incontinence. There were several with urethras so widely dilated that a finger could be inserted up to the internal sphincter, but there was no incontinence. In 1 patient the urethra had been excised for granuloma, yet the control of urine was improved through exercise of the muscles at the level of the vesical outlet.

Similarly, prolapse of the bladder, commonly diagnosed as cystocele, malposition or angulation of the bladder, has not presented a serious problem in the restoration of control, provided it was possible to increase the function of the muscles at the level of the vesical outlet. Moderately advanced thick-walled cystoceles do not require repair operation and will recede with improvement of the supportive musculature. In the presence of large, protruding thin-walled hernias of the bladder the patient is given exercises to restore control of urine and not until this has been accomplished is surgical repair recommended. Moderate uterine prolapse, which is encountered in the majority of my patients, is in itself not a factor in incontinence and merely indicates that the supportive function of the pelvic musculature is poor. Descensus can usually be improved by exercise therapy.

The most serious local factors interfering with restoration of sphincteric function are (1) injury of the pubococcygeus muscle and (2) scar tissue that distorts the vesical outlet. The first of these complications to come to my attention was unilateral injury of the pubococcygeus muscle, reported in 1950.[5] In the course of exercise therapy it was discovered that on one side of the vesical neck the pubococcygeus would become rounded, firm and strong, while on the opposite side it remained fibrous, retracted and tender. Unilateral injury of the pubococcygeus occasionally involves the entire muscle on one side, but more frequently only a segment is destroyed, leaving a deep atrophic furrow between intact longitudinal strands. When the tip of the index finger is inserted into the gap, it can be traced to the region of the vesical outlet.

With exercise therapy the pubococcygeus is restored on the uninjured side and remains atrophic on the other side. Concomitantly a portion of the bladder returns to a higher position, leaving a unilateral cystocele on the side of muscle injury.

When the pubococcygeus continues atrophic on both sides in spite of adequate muscle therapy, bilateral injury must be suspected. Atrophy of the pubococcygeus may also be brought on by neural disease; thus it is occasionally impossible to determine whether injury is the sole cause of the lesion.

Injuries occurring with childbirth are rarely as extensive or as serious as those following attempts at surgical repair. Childbirth injuries of fibers of the pubococcygeus are more common than was originally assumed. The lesion is often obscured by poor function and atrophy of other portions of the muscle on both sides. As a rule, moderate defects come to light only after a course of exercises that restores the function of intact fibers. I am certain that surgical procedures are made much more difficult becaus previo jury of the pubococcygeus muscle had not been recognized. Electromyographic studies were recently employed by Jones to confirm the therapeutic evidence of injury of the pubococcygeus.[6] He attempted plastic repair of the defect by the Neel-Rawls technic, but according to his report considerable weakness remained.[7] Women with severe injuries of the pubococcygeus are truly pelvic cripples.

Several other postoperative defects have recently been observed to complicate relief of stress incontinence. These may be described as constriction of the middle third of the vagina, shortening of the anterior vaginal wall and immobilization of the lower segment of the pubococcygeus. The last-mentioned is apparently due to the suturing of a prolapsed pillar of the levator ani muscle into the fascial structure of the urogenital diaphragm. Occasionally the lower segment of the pubococcygeus muscle has been severed in the course of a high mediolateral episiotomy. These defects have been observed by many clinicians who did not realize that the lesions interfere with supportive, sphincteric and sexual functions. In my series of cases these complications have not been encountered after the more physiologic types of surgical repair. It is suggested that they can be prevented by selecting more suitable operations. With regard to technic, it is important that in dissection one should avoid severing fibers of the pubococcygeus muscle, and that sutures should be carried less far laterally and never tied so tightly as to strangulate muscle fibers.

In the physiologic treatment of stress incontinence complicated by any one of these postoperative defects, control can be improved if enough fibers of the pubococcygeus remain intact. Scar tissue that is not too thick or dense will soften with adequate exercise.

A more remote cause of stress incontinence is revealed in the histories of 9 patients in whom incontinence developed after transverse incision of the rectus abdominis for cholecystectomy. I have not encountered this phenomenon after longitudinal incision of the rectus muscle. This indicates that the rectus abdominis and the pubococcygeus are interrelated, functionally as well as anatomically.

Physiologic therapy was not designed for the relief of incontinence due to—or complicated by—*systemic factors*. As a matter of policy, however, I have treated all such conditions, in order to discover what effect muscle education and resistive exercise may have upon this type of incontinence. Originally, senile or obese patients were referred to the Perineometer Clinic because they are poor surgical risks. Much to my surprise, these patients presented fewer difficulties than other groups, and the results were far beyond my expectation. The reason is that obese women with huge thighs and pendulous labia are plagued by uncontrollable cutaneous irritation and obnoxious odor. Their incentive to exercise, therefore, is greater than that of other patients. They listen carefully to instructions and exercise intensively. In my first series of 22 obese patients other complications were insignificant, and all were completely relieved, as was reported in 1952.[8] Elderly patients (from 60 to 88) did very well as a group, provided they were able to understand and remember instructions. Few of them were employed, and they had ample opportunity for exercises. The experience with obese and senile patients demonstrates again that the results of medical therapy depend largely on the amount of time the patient devotes to exercises.

Many patients in whom incontinence was associated with systemic disease were referred to the Perineometer Clinic. Because of unexpected relief in some cases, I have applied physiologic therapy whenever possible. The best results were obtained in the early stages of diabetes, Parkinson's disease and neurosyphilis. Several epileptics learned control between seizures. Patients with spastic cord bladders due to multiple sclerosis and poliomyelitis, treated at the Kabat-Kaiser Institute in Santa Monica, did not improve, except that a few reported less spasm at night.

Results.—Since the beginning, in 1946, of intensive studies related to the nonoperative therapy of stress incontinence, the results of treatment for all types of patients were broken down into five different categories: cured, greatly improved, cured but showing recurrence, slightly improved and unimproved.[8] Over the years I learned that in reality I was treating two different clinical entities: in the one the principal factor was functional; in the other the main issue was a complicating factor, such as trauma or systemic disease. With simple stress incontinence it is important only to know whether or not the patient has been cured; if she has not become dry, it is usually a matter of inadequate therapy. With regard to incontinence complicated by extraneous factors, it is of the greatest value to know whether any degree of improvement can be obtained by physiologic therapy alone.

Earlier figures[8] showed that simple stress incontinence of urine can be cured in 86 per cent of cases. In the remaining 14 per cent, many patients were improved but could not be listed as cured because they lost urine with severe coughing spells, fatigue or cystitis. In cases of this type the same rate of cure is consistently obtained in private practice.

In the second group, severe injury or systemic factors interfere with restoration of function of the pubococcygeus muscle. Fortunately, a degree of residual function remains in most instances and can be developed to strengthen control. At the Perineometer Clinic, 90.56 per cent of all patients showed improvement ranging from slight to excellent; only 9.43 per cent were classified as not improved. Before they were referred to the Perineometer Clinic nearly all of these patients had been seen by surgeons, and operative correction was considered inadvisable. Half of them (49.01 per cent) had previously undergone one or more pelvic operations. Evidence of unilateral or bilateral injury of the pubococcygeus was present in 26.81 per cent of cases. The initial strength of contractions, as measured by the perineometer, was between 0 and 10 mm. of mercury. It was gratifying that in a series containing so many difficult cases some degree of improvement could be obtained in 9 out of 10 patients.

Degrees of improvement were judged by two standards: the patient's statements and the results of physical examination. A patient's report that she can "hold the urine better" is always relative. One may be pleased if she can do her shopping without wetting herself; another is satisfied if she can reach the toilet at home, and a third will complain bitterly if she loses a few drops of urine at the races.

With regard to physical evidence of improvement, the following criteria were used: significant increase in tone and strength of the pubococcygeus, as determined by palpation and measurement with the perineometer; in addition, slight changes toward a more nearly physiologic position of the perineum, urethra, bladder and uterus.

Complicated stress incontinence is a chronic incapacitating condition, and any improvement that makes the patient's life more tolerable is worth while. Furthermore, the response to treatment constitutes a therapeutic test. This method of evaluation and procedure is the basis of all physiologic therapy. Once a slight improvement in the control of urine can be obtained in a given case there is always a chance that with continued effort further progress can be made.

COMMENT

The physiologic treatment of urinary incontinence has afforded an unusual opportunity for a detailed study of neuromuscular functions of the female pelvis. Nonsurgical therapy requires that the patient's progress be closely observed at regular intervals over a period of many months. It is thus possible to correlate gradual changes in structure and function with changes in symptoms. Such observations of cause and effect have been repeated many hundreds of times. Even to follow a single patient through a course of successful physiologic therapy is a stimulating opportunity. It soon becomes obvious that stress incontinence is not a separate disease entity, but merely a symptom. The condition is always secondary to neuromuscular dysfunction, which consistently manifests itself in the pubococcygeus muscle. When the functions of this muscle are improved through adequate muscle education and resistive exercise, some degree of change referable to the pelvic viscera is invariably noted by both patient and physician.

The clinical entity of dysfunction or weakness of the pubococcygeus is common and is the cause of many complaints. This is easy to prove, merely by noting which symptoms are alleviated as function of the pubococcygeus is restored. Stress incontinence is not the only complaint relieved, for at the same time many patients volunteer the information that pelvic fatigue, a sense of fullness, "low backache" and disagreeable sexual sensations often disappear. Examination usually reveals that the perineum, bladder and uterus have assumed a more nearly normal position and that the perivaginal tissues are less tender. Sometimes it is observed that the consistency of the uterus and the broad and uterosacral ligaments is improved and vascular congestion relieved. The effect of physiologic therapy is not restricted to the tissues at the level of the vesical outlet, but structures of the entire pelvis undergo favorable changes. Perhaps the reason for the success of physiologic therapy is that it treats an entire chain of factors and not merely an isolated link.

The overall significance of the results obtained with this method is the fact that stress incontinence is preventable. The physiologic disturbance responsible for this condition is reversible at any time in a woman's life. Among complicating factors, the trauma of delivery and of surgical repair can be avoided. During pregnancy, definite prodromal signs may be recognized and treated, thereby forestalling postpartum incontinence. Bushnell has continued his studies, begun in 1950[9] and will shortly report a series of 755 obstetric cases in which cystocele and urethrocele were practically eliminated and incontinence did not occur.[10] Trauma interfering with muscular function can be prevented by selection of surgical procedures approximating the physiologic. My therapeutic data have shown that even incontinence associated with systemic disease is influenced by muscle education and resistive exercise, especially in the early stages. Physiologic therapy, therefore, is indicated at the first sign of weak control of the bladder, regardless of cause. The best opportunity for early recognition and preventive treatment of poor function of the pubococcygeus is presented at premarital examination and during the first pregnancy.

In view of the crucial importance of the pubococcygeus, it is suggested that clinicians study the functions of this muscle routinely in all patients. Whenever they note any sign of reduced function, they may bear in mind that by strengthening the pubococcygeus they will prevent genital relaxation with all its symptoms, including stress incontinence.

SUMMARY

1. Stress incontinence of urine, uncomplicated by severe trauma or systemic disease, was cured in 86 per cent of cases by physiologic, nonoperative therapy; in the remaining 14 per cent it was improved but occasional loss of urine continued.

2. During a period of seven years, 455 patients were referred to the Perineometer Clinic for physiologic treatment of stress incontinence; 223 had previously undergone one or more pelvic repair operations; other complications included obesity, senility and systemic diseases. In this group improvement varying from slight to excellent was obtained in 90.56 per cent. In the remainder of cases it was impossible to engender muscular function.

3. Dysfunction of the pubococcygeus muscle was present in all cases. There were 54 nulliparae and 6 virgins. Five women had been delivered by cesarean section. In 195 women weakness of the bladder had existed prior to the first pregnancy.

4. In 92.30 per cent contractile strength of the pubococcygeus was weak, i.e., zero to 10 mm. of mercury as measured with the perineometer. Increase in function of the pubococcygeus resulted in improved control. The technic of examination, muscle education and exercises with and without the perineometer is presented in detail. Factors complicating medical treatment are discussed.

5. The common type of simple stress incontinence is a reversible neuromuscular disturbance. It can be prevented by therapeutic measures instituted at the first sign of weakness of the pubococcygeus muscle.

RÉSUMÉ

1. Si l'incontinence primaire à cause d'effort n'était pas compliquée d'un traumatisme sévère ou d'une maladie systémique, 86% des cas furent guéris par thérapeutique physiologique, sans opération. Chez les autres 14% la condition fut améliorée, mais ils continuèrent de perdre de l'urine de temps en temps.

2. Pendant une période de sept ans 455 malades étaient envoyés à la clinique perinéometrique pour traitement physiologique de l'incontinence urinaire à cause d'effort; 223 avaient subi une ou plusieures opérations pelvines, reparatrices. Parmi d'autres complications il y avait obésité, sénilité et des maladies systémiques. Dans ce groupe le degré d'amélioration variait de peu à excellent, dans le reste des cas c'était impossible d'obtenir aucune fonction musculaire.

3. Malfonction du muscle pubo-coccygeal était presente dans touts les cas. Il y avait 54 nulliparae et 6 vierges. 5 femmes avait eu une opération cesaréenne. Chez 195 femmes la faiblesse de la vessie était présente avant lá première grossesse.

4. 92.30% avaient peu de force contractile du muscle pubo-coccygeal, entre 0 et 10 mm. de mercure, mesuré au perinéomètre; une meilleure fonction du pubococcygeus résulta en meilleur contrôle de la vessie. Le technique de l'examen, l'éducation du muscle et les exercices avec et sans perinéomètre sont présentés en détail. Des facteurs qui compliquent le traitement physiologique sont discutés.

5. Le type ordinaire d'une simple incontinence urinaire est un dérangement neuro-musculaire réversible, que l'on peut remédier par des mesures thérapautiques au premier signe de faiblesse du muscle pubo-coccygéal.

ZUSAMMENFASSUNG

1. Die primäre und nicht durch schwere Verletzungen oder Systemerkrankungen komplizierte Druckinkontinenz des Harnes wurde in 86% der Fälle mit physiologischer, nicht-operativer Behandlung geheilt; in den übrigen 14% trat eine Bes-

serung mit Fortbestehen gelegentlichen Harnverlustes ein.

2. Innerhalb von sieben Jahren wurden der Perineometer-Klinik 455 Kranke zur physiologischen Behandlung von Durckinkontinenz des Harns überwiesen; von diesen hatten 223 vorher eine oder mehrere Wiederherstellungs operationen des kleinen Beckens durchgemacht; weitere Komplikationen bestanden in Fettsucht, Senilität und Systemerkrankungen. In diesem Beobachtungsmaterial wurden Besserungen verschiedenen Grades bei 90,56% der Kranken erzielt; in den übrigen Fällen liess sich keine Muskelfunktion hervorrufen.

3. In allen Fällen bestand eine Dysfunktion des M. pubococcygeus. Unter den Patientinnen befanden sich 54 Frauen, die noch nie geboren hatten, und 6 Jungfrauen. Fünf Frauen hatten Kaiserschnittsentbindungen durchgemacht. Bei 195 Frauen bestand eine Harnblasenschwäche vor der ersten Schwangerschaft.

4. In 92,3% der Fälle war die Kontrakationskraft des M. pubococcygeus schwach, d.h. die Messung mit dem Perineometer ergab 0 bis 10 mm Hg. Stärkung der Funktion des M. pubococcygeus führte zu einer Verbesserung der Harnkontrolle. Die Technik der Untersuchung, der Muskeltrainierung und der Übungen mit und ohne Perineometer wird ausführlich dargestellt. Faktoren, die eine physiologische Behandlung komplizieren, werden erörtert.

5. Die gewöhnliche Form der einfachen Inkontinenz des Harnstroms stellt eine reversible neuromuskuläre Störung dar, die sich durch beim ersten Zeichen von Schwäche des M. pubococcygeus eingeleitete therapeutische Massnahmen verhüten lässt.

RIASSUNTO

1. L'incontinenza urinaria non complicata da trauma grave o da malattia sistemica, fu curata nell'86% dei casi medicalmente—senza intervento chirurgico; nel restante 14% fu migliorata, ma continuò una saltuaria perdita d'urina.

2. Su un periodo di 7 anni si ricoverarono alla Clinica Perioneometrica 455 pazienti per la cura medica della incontinenza urinaria; 223 erano stati precedentemente sottoposti a una opiù operazioni pelviche. In questo gruppo Negli altri fu impossibile ripristinare la funzione muscolare.

3. In tutti i casi era presenta una disfunzione del muscolo pubo coccigeo. Vi erano 54 nullipare e 6 vergini. Cinque donne furono sottoposte al taglio cesareo. In 195 donne la debolezza della vescica esisteva prima della prima gravidanza.

4. Nel 92,30% la forza contrattile del muscolo pubococcigeo era scarsa, cioè da zero a 10 millimetri di mercurio al perineometro. Un'aumentata funzione del muscolo pubococcigeo diede, come risultato, un miglior controllo urinario. Viene dettagliatamente presentata la tecnica di esame, l'educazione del muscolo e gli esercizi fatti con o senza perineometro. Sono discussi i fattori che complicano la cura medica. Il tipo comune di incontinenza urinaria semplico è un disturbo neuromuscolare riversibile. Si può prevenirlocon accorgimenti terapeutici al primo segno di debolezza del muscolo pubococcigeo.

SUMARIO

1. A incintinência urinária, não complicada por trauma grave ou molestia sistêmica, foi curada em 86 por cento dos casos por terapeutica médica não operatória, nos 14 por cento restantes, foi melhorada, mas a perda continua de urina continuou.

2. Durante um período de sete anos, 455 pacientes foram encaminhados à Clínica Perineométrica para tratamento médico de incontinência urinária; 223 tinham se submetido previamente a uma ou mais operações pelvicas; outras complicações

incluiam obesidade, senilidade e molestias sistêmicas. Neste grupo, a melhora variou de muito pouco, ao excelente em 90,56%, no restante dos casos foi impossivel recuperar a função muscular.

3. A disfunção do músculo pubo-cocigeano estava presente em todos os casos. Havia 54 nuliparas e 6 virgens. Cinco mulheres tinham se submetido à operação cesariana. Em 195 mulheres a fraqueza da bexiga existia antes da primeira gravidês.

4. Em 92,30% a fôrça contratil do pubo cocigeano era fraca, isto é, de zero a 10 milímetros de mercúrio, medida com o perineômetro. O aumento da função pubococigeana resultou em melhora do controle urinário. A tecnica de exame, educação do músculo, e exercicios com e sem o perineâmetro são apresentados detalhadamente. Fatores complicando o tratamento médico são discutidos.

5. O tipo comum de incontinência urinária simples, é um disturbio neuro muscular reversivel. Isto pode ser prevenido por meio de medidas terapeuticas instituidas ao primeiro sinal de fraqueza do músculo pubo cocigeano.

REFERENCES

1. Kegel, A. H.: (a) The Nonsurgical Treatment of Genital Relaxation, Ann. West. Med. & Surg. 2:213-216, May 1948. (b) Progressive Resistance Exercise in the Functional Restoration of the Perineal Muscles, Am. J. Obst. & Gynec. 56:238-248, August 1948. (c) The Physiologic Treatment of Poor Tone and Function of the Genital Muscles and of Urinary Stress Incontinence, West. J. Surg. 57:527-535, November 1949. (d) Treatment of Stress Incontinence of Urine, in Meigs, J. V. & Sturgis, S. H.: Progress in Gynecology, New York: Grune & Stratton, Inc., 1950, vol. 2, pp. 690-697. (e) Physiologic Therapy for Urinary Stress Incontinence, J.A.M.A. 146:915-917, July 7, 1951. (f) Stress Incontinence and Genital Relaxation, Ciba Clinical Symposia 4:35-51, February-March 1952. (g) Sexual Functions of the Pubococcygeus Muscle, West. J. Surg. 60:521-524, October 1952. (h) Kegel, A. H., and Powell, T. O.: The Physiologic Treatment of Urinary Stress Incontinence, J. Urol. 63:808-813 (May) 1950.

2. Nemir, A., and Middleton, R. P.: Stress Incontinence in Young Nulliparous Women, Am. J. Obst. & Gynec. 68:1166-1168, October 1954.

3. [illegible]rinary Incontinence [illegible] ulas, Acta. Obst. & Gy[illegible] 1952.

4. Trahey, P. A., and Pacey, H. K.: Stress Incontinence in the Female, Australian & New Zealand J. Surg. 17:247-252, April 1948.

5. Kegel.[1d] Kegel.[1f]

6. Jones, E. G.: Injuries of Pubococcygeus. II. Detection and Cure of Recent Injuries in Primiparas, Surg., Gynec. & Obst. 100:409-413, April 1955.

7. Jones, E. G.: Injuries of Pubococcygeus. I. Permanent Injuries Complicating Vaginal Plastic Surgery, Surg., Gynec. & Obst. 100:191-195, February 1955.

8. Jones, E. G., and Kegel, A. H.: Treatment of Urinary Stress Incontinence, Surg., Gynec. & Obst. 94:179-188, February 1952.

9. Bushnell, L. F.: Physiologic Prevention of Postpartal Relaxation of Genital Muscles, West. J. Surg. 58:66-67, February 1950.

10. Bushnell, L. F.: Personal communication.

> Men have their virtues, their vices, their heroism, their perverseness, they possess and exercise all that is good and all that is bad in this world.
>
> —*Napoleon*

Ophthalmologic Surgery

Dermoid of Cornea and Sclera

ELBYRNE G. GILL, M.D., F.A.C.S., F.I.C.S.
AND
RONALD B. HARRIS, M.D.
ROANOKE, VIRGINIA

THE cause of dermoid tumors of the cornea and sclera is not definitely known. Duke Elder suggested that they may result from simple exposure of the surface of the ocular globe, which tends to produce a dermoid transformation of the tissues in conformity with the rest of the surface of the body.

Others have conjectured that a failure in union of the lids occurs during fetal life. Heraenschwand hypothecated an organic adhesion of the lid margin to the surface of the globe. Still others have expressed the opinion that this type of tumor represents the residue of amniotic bands.

The lesion is not to be confused with a dermoid cyst: in the latter the inner wall is a cavity composed of skin, the contents of which are made up of hair, desquamated epithelium and glandular secretions.

REPORT OF CASE

J. S., a 16-year-old girl, had had a lesion on the left eye since birth. Over the past year the lesion had been gradually growing. It was asymptomatic except for increased lacrimation in the affected eye. The patient had noticed hair growing from the lesion for some years. The functional and familial history were essentially normal.

Physical Examination.—The right eye was normal. The left eye revealed a lesion localized in the upper and outer quadrant; it was elevated approximately 2 to 3 mm., and it measured approximately 10 by 8 mm. It was white and occupied a site partly over the cornea and partly over the sclera. Five hairs were projected from the keratinized surface. No secretion was observed. The remainder of the ocular examination gave essentially normal results. Vision in the right eye was 20/20; in the left, 20/20. Convergence and rotations were normal.

The preoperative diagnosis was congenital dermoid of the cornea and sclera. The lesion was excised surgically, with local anesthesia. It involved the entire thickness of the cornea. A superficial lamellar keratectomy was done, and the remaining tumor base was electrocoagulated so as not to perforate the cornea. The area over the sclera was excised with little difficulty. A conjunctival flap was used to cover the tumor base.

The patient's recovery was uncomplicated, and after two months the site of the excision was well healed, with only a small area of scarring on the cornea. The cosmetic result was good and the 20/20 vision in the left eye was uncorrected.

Microscopic sections of the tumor showed it to be lined with stratified squamous epithelium. The center of the epithelium showed slight hyperkeratotic pigmentation. In the underlying stroma there were two hair follicles and numerous sebaceous glands. The diagnosis was ectopic skin, or dermoid, of the cornea and sclera.

SUMMARY

This case is an instance of one of the rare benign tumors of the cornea and

---

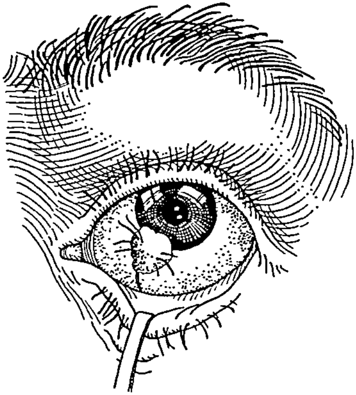
From the Department of Ophthalmology, Gill Memorial Eye, Ear and Throat Clinic.

Submitted for publication Jan. 12, 1956.

sclera. Dermoid tumors are congenital lesions, occurring primarily at the limbus and mainly in the upper and outer quadrant. A dermoid is a somewhat elevated whitish formation, very small at birth, that may slowly extend over the cornea in later life. Anatomically, it represents an island composed of dense collagenous connective tissue covered with stratified epidermoid epithelium containing a granular base, with keratin on the surface. In the underlying area, nerve bundles and sweat glands are seen. There may be thinning or absence of the sclera or cornea. In the case here reported a definite thinning of the cornea was present.

Visual acuity was not altered in this case, but it may be altered by astigmatism produced by the lesion or by actual extension across the pupillary area. The cornea may become infiltrated in the area adjacent to the tumor (Lipid infiltration). A small amount of such infiltration was noted in this case.

The growth of these lesions may become markedly altered at puberty or as a result of chronic irritation. Dermoids may be associated with coloboma of the lid, aniridea and all grades of microphthalmos, as well as asymmetry of the face or deformity of the ears, the mouth and other parts of the body. Commonly this lesion is associated with a similar tumor located in front of the tragus of the ear. No associated abnormalities were noted in this case.



Dermoid involving cornea and sclera (see text).

Treatment is by excision.

COMMENT

The author reports a case of dermoid cyst of the cornea and sclera in a girl aged 16. The exact cause of these tumors is unknown, but they are congenital.

In the case reported, the lesion was surgically removed and was seen to have involved the entire thickness of the cornea. On histologic examination, two hair follicles and numerous sebaceous glands were observed in the stroma.

ZUSAMMENFASSUNG

Der Verfasser berichtet über den Fall einer Dermoidzyste der Horn- und Lederhaut bei einem 16jährigen Mädchen. Die genaue Ursache solcher Geschwülste ist nicht bekannt, sie sind aber angeboren. Im vorliegenden Falle wurde die Geschwulst chirurgisch entfernt, und es ergab sich, dass sie die gesamte Dicke der Hornhaut betraf. Die histologische Untersuchung zeigte zwei Haarfollikel und zahlreiche Talgdrüsen im Stroma.

RÉSUMÉ

L'auteur reporte un cas de kyste dermoide de la cornée et sclérotique chez une jeune fille agrée de 16 ans. La cause exacte de ces tumeurs est inconnue, mais ils sont congénitaux. Dans le cas reporté la lésion fut enlevée chirurgicaléments, et on voyait, qu'elle avait pénétré l'épaisseur entière de la cornée. A l'examen pathologique on trouva 2 follicules pileux et nombr euses glandes sébacées dans le stroma.

RIASSUNTO

L'autore riferisce un caso di cisti dermoide della cornea e della sclera in una ragazza di 16 anni. Questa affezione è congenita, ma la sua vera causa è ignota; asportata, si dimostrò localizzata nello spessore della cornea e all'esame istologico conteneva follicoli piliferi e ghian dole sebacee.

BIBLIOGRAPHY

Algernon, B. R.: Tumors of the Eye. New York: Paul B. Hoeber, Inc., 1953.

Anderson, W. A. D.: Pathology. St. Louis: The C. V. Mosby Company, 1953.

Elder, D., and Stewart, W.: Textbook of Ophthalmology, St. Louis: The C. V. Mosby Company, 1938, vol. 2, pp. 1405-1407.

Samuela, B., and Fuchs, A.: Clinical Pathology of the Eye. New York: Paul B. Hoeber, Inc., 1952.

In addition to the envy of the old for the young and of the herd for the exceptional, the impulse to blame, which men call morality, owns another source. This is the desire for uniformity. The desire for uniformity springs in its turn from the fear of insecurity. Society, says Schopenhauer, is like a collection of hedgehogs driven together for the sake of warmth. The object of social observances is to put felt upon the spikes in order that the proximity of the hedgehogs may not cause them to injure one another. The risk of friction will be reduced to a minimum, if all the hedgehogs behave in the same way. Identical behaviour in all circumstances is, no doubt, an unattainable ideal: but this makes it doubly important that the herd as a whole should know within limits in what way each of its members *will* behave. Those who react unexpectedly to familiar situations, or differ markedly in their conduct from others, are a danger to the herd, causing social friction and a sense of insecurity. For this reason reformers like Christ or Ibsen, who violently question the standards of thought and conduct prevalent in their herds, and refuse to conform to them, are regarded with bitter hostility.

—*Joad*

Orthopedic Surgery

Letterer-Siwe's Disease and Eosinophilic Granuloma of Bones

Report of Two Cases

S. K. WANG, M.D., F.I.C.S.

TAIPEI, FREE CHINA

LETTERER-SIWE'S disease and eosinophilic granuloma of bone have been recently grouped with the so-called Hand-Schüller-Christian syndrome as related clinical and pathologic entities.[1] These disease processes affect children almost exclusively. They are all characterized by the presence of yellow tumors or tumor-like swellings, which frequently invade the skeletal system, particularly the membranous bones. Histopathologically these tumors are composed of large mononuclear cells (histiocytes), which may or may not contain lipoid. There is also a heavy infiltration of leukocytes and eosinophils.

This pathologic process may be self-limited, producing a single focus or multiple foci in the skeletal system, as in cases of eosinophilic granuloma of bone. It may spread widely and involve a variety of regions, such as the orbital fossa, the cranial contents, the lymph nodes, the lung, the liver, the spleen and the retroperitoneal spaces, in addition to the skeletal system. The accumulation of xanthomatous granulomas inside the orbit results in exophthalmos. Involvement of the hypothalamic region of the brain and the pituitary gland produces symptoms of diabetes insipidus. The presence of this triad, exophthalmos, diabetes insipidus and defects of the membranous bone, has been considered the distinctive feature of the Hand-Schüller-Christian syndrome, which, although it has been associated with widespread involvement, usually runs a more chronic course and may at times regress spontaneously. The more acute form, which is known as Letterer-Siwe's disease, is usually complicated by a febrile course, hypochronic secondary anemia and purpura. It is well known that this form of the disease often has a fatal termination. These conditions, however, are seldom encountered, and only about 200 cases had been reported up to 1940.[2] In the past decade a few small isolated series have been added by Aronson,[3] Kintzen,[4] Henderson and Thompson,[5] Fisher,[6] Dawes,[7] Cureton,[8] Hansen,[2] Green and Farber[9] and Jaffe and Lichtenstein.[10] Two cases have been encountered at this center, and the patients have been under its care during the past two years. Since they have never been reported from this locality, I wish to present them here and add them to the scanty collection.

REPORT OF CASES

CASE 1.—L. P. S., a 6-year-old girl, was admitted to the First General Hospital on March 23, 1955, for a growing mass of three months' duration over the right parieto-occipital re-

---

From the National Defense Medical Center, Taipei.
Submitted for publication Jan. 12, 1956.

gion. It was symptomless and had been accidentally discovered by the mother. The child was otherwise in perfect health.

Physical Examination.—The child was well developed and well nourished. Except for the growing tumor over the head, physical examination revealed no abnormality. A round tumor 4 by 4 by 4 cm. was observed over the right parieto-occipital region. It was rubbery, not tender, and firmly attached to the underlying skull. The mass was aspirated with a No. 18 needle, and only a few cubic centimeters of blood were obtained.

Laboratory Data. — A blood count revealed 5,200,000 erythrocytes and 8,800 leukocytes per cubic millimeter, with 40 per cent lymphocytes and no eosinophils. The urine and stool were normal. The value for blood cholesterol was 275 mg. per hundred cubic centimeters.

Roentgen Examination.—The skull revealed a round area of osseous destruction over the right parieto-occipital region. The chest and he rest of the skeletal system were normal.

Operation. — With the patient under ether anesthesia, the tumor was excised *in toto.* It was situated between the galea and the dura, from which it could be easily separated. There was a round area of complete destruction of the skull over the tumor site. The edge of the defect was rather smooth and had not been invaded by the tumor. The excision was grossly complete. The wound was closed in layers and healed *per primam* in a week's time. The child was discharged from the hospital on April 13, in good condition.

Pathologic Examination.—The gross specimen consisted of a well-encapsulated tumor measuring 3 by 3 by 1.5 cm. It was soft and homogeneously yellowish. Microscopic sections revealed that the tissue was composed of large numbers of eosinophils, lymphoid cells and vacuolated histiocytes. In some areas a few multinucleated giant cells were also observed. There was an abundant network of capillaries. A few scattered areas of necrosis and fibrosis were also encountered.

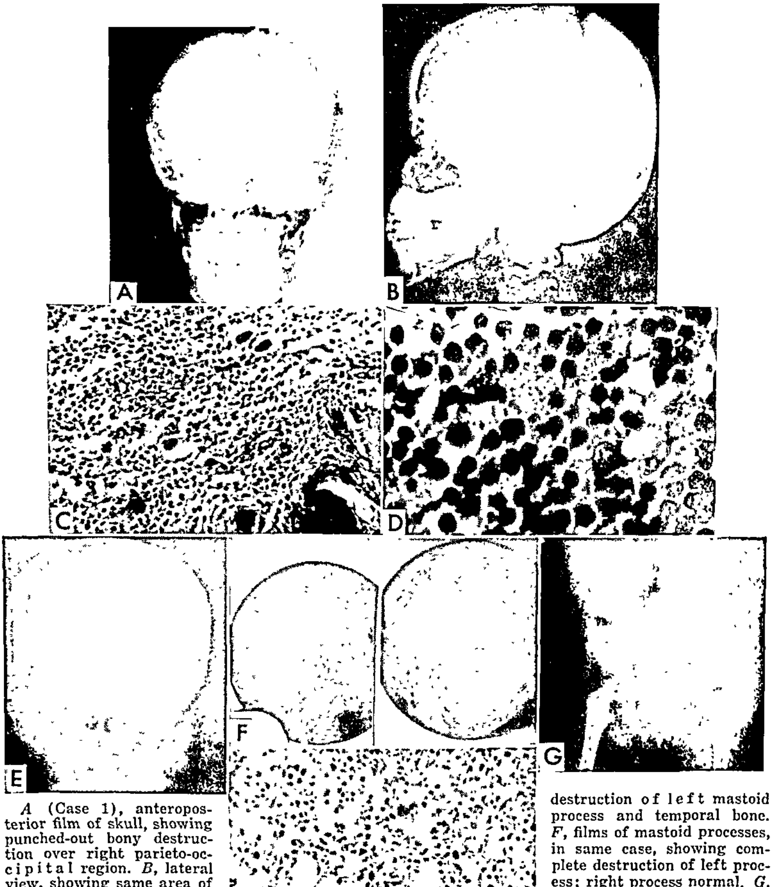
The histopathologic picture of the surgical specimen was typical of tumors diagnosed as eosinophilic granuloma. In fact, the roentgen picture of the skull is so unusual that this diagnosis had been considered before the surgical excision and pathologic examination. The child had apparently a single lesion, but one cannot be sure that others will not develop in the course of time. It had been reported that as many as 27 separate lesions developed in the skeleton of a patient within eight to ten years.

Eosinophilic granuloma of bone was first described by Jaffe and Lichtenstein as a localized osteolytic bone lesion with a uniform histologic picture characterized by granuloma formation and accumulation of eosinophils, leukocytes, histiocytes and giant cells in a tissue consisting chiefly of reticular cells. The disease is encountered in children and adolescents. It usually runs a benign course and can be cured by irradiation or by surgical excision. Sometimes it may heal spontaneously. The lesion may be solitary or multiple. In some patients, later involvement of lymph nodes, spleen, liver, lung and skin may take place. The process then becomes clinically indistinguishable from Hand-Schüller-Christian's disease or Letterer-Siwe's disease.

CASE 2.—*First admission.* A 2-year-old girl was first admitted to the E. N. T. service of the First General Hospital on March 7, 1953, because of a swelling over the left postauricular region, present for about two months. The swelling appeared to be inflammatory, although the child presented no sign of acute infection. She was given a trial of penicillin therapy, which had no beneficial effect. She was then admitted to the hospital with the diagnosis of acute mastoiditis and perimastoid abscess.

First Operation. — With open ether anesthesia, simple mastoidectomy was done March 9. During the operation, extensive necrosis was observed, involving the mastoid, and the cavity was filled with dirty yellowish granulation tissue. The dural palate was perforated, and there was no sign of epidural infection. All the necrotic tissue was curetted away and the cavity packed open for drainage. The postoperative course was uneventful, and the patient was discharged from the hospital ten days later.

The wound, however, failed to respond to treatment. It persisted as a discharging sinus. Two months later a follow-up roentgen examination revealed that the bony destruction



A (Case 1), anteroposterior film of skull, showing punched-out bony destruction over right parieto-occipital region. *B*, lateral view, showing same area of destruction. *C* and *D*, low and high power photomicrographs (hematoxylin and eosin stain) of excised granuloma in same case. Note that tissue is composed of many mononuclear cells with a few scattered multinuclear giant cells. Note piece of bone in *C*. *D* shows same cells with deeply stained nuclei and vacuolated cytoplasm. *E* (Case 2), anteroposterior film of skull, showing extensive destruction of left mastoid process and temporal bone. *F*, films of mastoid processes, in same case, showing complete destruction of left process; right process normal. *G*, film of pelvic bones in Case 2. Note area of bony destruction of right ilium. *H*, photomicrograph of granuloma (autopsy specimen) in same case, showing many large mononuclear cells arranged in loose strands. Dark-stained cells are multinuclear giant cells.

was progressing. It has now extended to involve the surrounding temporal bone and also the zygomatic process. It seemed that the child was not suffering from an ordinary infection, so she was readmitted to the Neurosurgical Service on June 6 for further investigation.

Second Admission. — Examination at this time revealed that the child was still in fairly good condition. Her mind was clear. She was running an irregular fever, the temperature ranging between 37.5 and 38.5 C. Except for discharging sinus over the left postauricular region, no other abnormality was observed.

Laboratory examination revealed secondary anemia, with an erythrocyte count of 2,800,000 per cubic millimeter of blood and 10 Gm. of hemoglobin. There were 14,000 leukocytes per cubic millimeter, with 60 per cent neutrophils, 30 per cent lymphocytes and 2 per cent eosinophils. The urine and stool were normal. Lumbar puncture revealed normal pressure. The spinal fluid was clear. It contained 300 erythrocytes per cubic millimeter. Chemical and other examinations revealed it to be normal. Roentgen examination of the chest revealed essentially clear lungs. Bacteriologic study of the wound revealed nonspecific infection. Biopsy specimens taken at the edges of the wound revealed granulation tissue.

After admission, the patient was given general supportive treatments and a trial of various antibiotics. There was slight improvement of the secondary anemia, and the red blood cell count went up to 3,700,000 per cubic millimeter. The low grade fever persisted, however, and the local condition of the wound remained about the same.

Second Operation.—Exploration of the wound and removal of a biopsy specimen were carried out on June 25. There was a large defect (about 5 cm. across), involving the whole mastoid process and the surrounding temporal bone, which were filled with a mass of dirty, yellowish and extremely friable tissue. The surface of the mass was covered by a dense fibrous capsule, which could be separated from the overlying scalp but was firmly attached to the underlying dura. A large segment of the mass was excised and sent for pathologic examination. The wound was packed open for drainage. Microscopic section of the removed tissue revealed it to be composed mainly of granulation tissue with areas of fibrosis and necrosis. There was diffused leukocytic infiltration, and many giant cells were observed throughout the tissue. There was also conspicuous infiltration of eosinophilic cells.

Third Operation.—The patient did not respond to the usual management and the condition was thought to be some type of nonspecific inflammation. It was therefore decided to excise the lesion surgically if possible, and this was done on July 20. All the accessible tissue was removed, and the dura was curetted and coagulated with electric cautery. The edge of the bony defect was thoroughly rongeured. The skin edges were then loosely approximated with sutures and the wound was again packed open for drainage.

The microscopic picture of the surgical specimen was similar to that of the last performed biopsy. The wound was then somewhat cleaner, and the patient was discharged from the hospital on July 31.

After the discharge she regularly visited the outpatient department for the dressing of the wound and follow-up. She appeared improved for a while; then the yellowish granulation tissue began to grow back into the wound. Irregular fever again developed. The right eye gradually protruded. The child's general condition slowly went downhill. In September the mother noticed that a growing mass had developed over the right gluteal region. The mass yielded fresh blood on aspiration. Roentgen examination revealed extensive destruction of the iliac bone.

Third Admission.—The child was readmitted to the hospital for the third time on October 9. She was now in a markedly debilitated state, and was running a temperature between 38.5 and 39.5° C. There was also generalized anasarca. The wound over the left mastoid region was still discharging and was filled with dirty granulation tissue. There was bilateral exophthalmos, much more evident on the right than on the left. Both parotid glands were swollen. All of the cervical lymph glands were enlarged. The edge of the liver was about three fingerbreadths below the costal margin. The spleen was firm and markedly enlarged; the longest axis measuring about 10 cm., over the right gluteal region. The red blood cell count was 2,500,000 and the white cell count 9,100 per cubic millimeter, with 49 per cent neutrophils, 50 per cent lymphocytes and 1 per cent eosinophils. The urine and stool were normal.

The child died four days after her final admission.

Autopsy.—The body showed evidence of generalized anasarca. There was an extensive granulomatous invasion involving the thymus, lymph nodes, spleen, bone (right ilium and left temporal), bone marrow, right orbital space, lungs, liver and pancreas. The granulomas were yellowish and of various sizes, with areas of hemorrhages and necrosis. Microscopically they were composed of numbers of large mononuclear cells, chiefly histiocytes. There was also a rather heavy infiltration of polymorphonuclear leukocytes and some eosinophils. In some areas, large numbers of multinuclear giant cells were noted. The liver showed signs of fatty degeneration. There was also evidence of bilateral bronchopneumonia.

The clinical course of this patient and the observation at autopsy fit in very well with the diagnosis of Letterer-Siwe's disease. This correct diagnosis, however, was never suspected until the terminal stage, when exophthalmos, lymphadenopathy, splenomegaly, hepatomegaly and a mass over the hip region developed.

Dawes[7] pointed out that eosinophilic granuloma in the temporal bone occurs often enough to merit the attention of otologists. The otic lesion, whether severe purulent otitis media or chronic mastoiditis, may be the presenting symptom or may develop during the course of the disease. Lesions may originate in either the squamous or the petrous portions of the temporal bones. Roentgenograms of the mastoid may show gross disorganization: a punched-out lesion in the squamous portion would be almost diagnostic. The only other condition that should be ruled out is tuberculous mastoiditis, from which it was mistakenly suspected that the child in Case 2 was suffering at the beginning.

Letterer-Siwe's disease is characterized by generalized hyperplasia of the reticuloendothelial system and the development of localized tumor-like proliferations especially in the spleen, liver, bone marrow, lymph nodes and skin. It occurs exclusively in children between 2 and 3 years of age. It bears an extremely grave prognosis and the patients usually run a rapid downhill course. The condition is almost always fatal. Cases have been recently reported, however, in which it responded satisfactorily to chloramphenicol and oxyetetracycline (Fisher[6]) and to streptomycin (Aronson[3]).

CONCLUSION

Letterer-Siwe's disease, Hand-Schüller-Christian's disease and eosinophilic granuloma of bone appear to be similar pathologic processes, but they vary in severity. They are characterized by proliferation of the reticuloendothelial cells and infiltration of mononuclear cells and eosinophils. In cases of eosinophilic granuloma the pathologic process is localized and often self-limited. In cases of Hand-Schüller-Christian's disease it involves a much wider area and frequently invades the orbit and the hypothalmohypophyseal region, thereby producing the classic clinical picture of exophthalmos and diabetes insipidus.

Letterer-Siwe's disease is the acute form of a similar pathologic process. It frequently invades the mastoid at an early stage and is therefore often mistaken for mastoiditis. The course is febrile, and hypochromic secondary anemia and purpura frequently occur. It runs a rather rapid progressive course and terminates fatally within a few months or a year. Not infrequently one form of such a disease process is transformed into another.

Because of the presence of a large amount of lipoid material, chiefly cholesterol, in the large mononuclear cells, Hand-Schüller-Christian's disease was once considered a disturbance of lipoid metabolism. With description of the other form, however, (Letterer-Siwe's disease and eosinophilic granuloma), in which there is no evidence of deposition of cholesterol in the tissue, opinion veered to the theory that it is more likely to be inflammatory. Recent reports of favorable results from treat-

ment with antibiotics add further evidence to the support of such an assumption.

SCHLUSSFOLGERUNGEN

Die Letterer-Siwesche Erkrankung, die Hand-Schueller-Christiansche Krankheit und das eosinophile Knochengranulom sind offenbar ähnliche pathologische Vorgänge, weisen aber Unterschiede in der Schwere der Erkrankung auf. Sie sind durch Wucherung der retikuloendothelialen Zellen und Infiltration von mononukleären und eosinophilen Zellen gekennzeichnet. In Fällen von eosinophilem Granulom ist der Krankheitsprozess örtlich umschrieben und bleibt oft begrenzt. In Fällen von Hand-Schueller-Christianscher Erkrankung sind viel grössere Gebiete betroffen, die häufig die Augenhöhle und die Gegend des Hypothalamus und der Hypophyse einschliessen und dann das klassische Krankheitsbild mit Exophthalmus und Diabetes insipidus hervorrufen.

Die Letterer-Siwesche Krankheit stellt die akute Form eines ähnlichen pathologischen Vorganges dar, der im frühen Stadium häufig den Warzenfortsatz befällt und dann oft fälschlich für eine Mastoiditis gehalten wird. Der Verlauf der Erkrankung geht gewöhnlich mit Fieber einher und ist häufig von sekundärer Blutarmut und Purpura begleitet. Die Krankheit schreitet ziemlich rasch fort und endet tödlich innerhalb weniger Monate oder eines Jahres. Gelegentlich kann sich eine Form dieser Erkrankungen in eine andere umwandeln.

Wegen des Vorhandenseins grosser Mengen lipoider Stoffe, hauptsächlich Cholesterin, in den grossen mononukleären Zellen wurde die Hand-Schueller-Christiansche Erkrankung früher für eine Form der Störung des Lipoidstoffwechsels gehalten. Als jedoch die anderen Krankheitstypen, nämlich die Letterer-Siwesche Erkrankung und das eosinophile Granulom bekannt wurden, bei denen es keine Anzeichen von Cholesterinablagerungen im Gewebe gibt, änderte sich diese Ansicht zugunsten der Theorie, dass es sich wahrscheinlich eher um einen entzündlichen Vorgang handle. Die in neuerer Zeit veröffentlichten Berichte über günstige Erfolge in der Behandlung dieser Krankheiten mit Antibiotika tragen zur Stützung dieser Theorie bei.

RÉSUMÉ

La maladie de Letterer-Siewe, de Hand-Schueller-Christian et le granulome éosinophilique des os sont des lésions pathologiques ressemblantes mais différentes en ce qui concerne la sévérite. Ils sont charactérisées par une prolifération des cellules réticulo-endothéliales et infiltration de cellules mononucléaires et éosinophiles. Dans les cas de granulome éosinophilique le procès pathologique est localisé et souvent guérit spontanément. Dans le cas de maladie de Hand-Schueller-Christian la maladie s'étend sur un terrain beaucoup plus large et souvent il y a une invasion dans l'orbite et la région hypothalamo-hypophyséale, produisant le syndrôme classique clinical d'exophthalmos et diabetes insipidus.

Le maladie de Letterer-Siewe est la forme aigue d'un procès pathologique, ressemblant. Souvent la maladie envahit le mastoide tôt, et par cela est confundue avec une mastoidite. Le course est en général fébrile et souvent une anemie hypochromique, secondaire et purpura appraissent. Le course est assez progressif et finit mortellement après quelques mois out une année. Pas trop souvent une forme d'une de ces maladies est transformée dans l'autre.

A cause de la présence d'une grande quantité de matériel lipoide, principalement du cholestérol, dans les larges cellules mononucleaires, on a regardé la maladie Hand-Schueller-Christian dans le passé comme un dérangement du metabo-

lisme des lipides. Tout de même après la déscription de l'autre forme, la maladie Letterer-Siewe et le granulome eosinophilique, ou il n'y a pas de cholestérole déposé dans les tissus, les opinions changeaient à la theorie de l'origine plutôt inflammatoire. Les reports recents de résultats favorables en traitant ces malades par des antibiotiques affirment une telle hypothèse.

CONCLUSIONI

La malattia di Letterer-Siwe, quella di Hand-Schuller-Christian e il granuloma eosinofili delle ossa sono affezioni simili ma diverse nella gravità. Sono caratterizzate da proliferazione delle cellule reticoloendoteliali e da infiltrati di elementi mononucleari ed eosinofili. Il granuloma eosinofilo generalmente è un processo localizzato e limitato; la malattia di Hand-Schuller-Christian interessa delle zone molto più ampie e spesso invade l'orbita e la regione ipotalamo-ipofisaria producendo la classica sindrome esoftalmo-diabete insipido. La malattia di Letterer-Siwe rappresenta la varietà acuta e di solito invade la mastoide precocemente e può essere scambiata con una mastoidite. Il suo decorso è febbrile, accompagnato da anemia ipocromica e porpora; ha un decorso abbastanza progressivo e fatale in pochi mesi o un anno. Spesso una di queste melattie può trasformarsi nell'altra. La presenza di grandi quantità di materiale lipoideo, sopratutto colesterolo, nelle grandi cellule mononucleari ha fatto si che la malattia di HSC sia stata considerata in passato come dovuta a disturbi nel metabolismo dei lipidi. Descritte le altre due forme, tuttavia, nelle quali non vi è deposizione di colesterolo si è giunti alla opinione che si tratti piuttosto di processi infiammatori. Si sono avuti, infatti, risultati favorevoli dalla cura con antibiotici.

REFERENCES

1. Grulee, and Eley: The Child in Health and Disease. Baltimore: The Williams and Wilkins Co. 1948, p. 501.
2. Hansen, A. E.: Acta Radiol. Stockholm 32: 89, 1949.
3. Aronson, A.: Lancet 1:889, 1951.
4. Kintner, E. P.: J.A.M.A. (Abstracts) 148: 968, 1952.
5. Henderson, L. F., and Thompson, E. C.: J.A.M.A. 151:294, 1953.
6. Fisher, S. H.: J. Bone & Joint Surg. 35-A: 445, 1953.
7. Dawes, J. D. K.: J. Laryngol. & Otol. 65: 575, 1954.
8. Cureton, R. J. R.: J. Path. & Bact. London 61:533, 1949.
9. Green, F., and Fasber, I.: J. Bone & Joint Surg. 24:499, 1944.
10. Jaffe, and Lichtenstein: Arch. Path. 37:99, 1944.

Many a treasure besides Ali Baba's is unlocked with a verbal key.

—*Van Dyke*

Carcinoma of Sigmoid Causing Sigmoidorectal Intussusception and Protrusion Through the Anus

J. B. PYPER, F.R.C.S.
AND
G. W. VAUSE GREIG, F.R.C.S., F.I.C.S.
NEWRY, NORTH IRELAND

ALTHOUGH some degree of intussusception due to a neoplasm of the sigmoid is not uncommonly observed at operation, gross intussusception through the anal sphincters is very rare.

REPORT OF CASE

Mrs. A. K., aged 60, had been well, with no previous intestinal upset, until Jan. 3, 1951, when diarrhea started which persisted for two days. On January 5, during defecation, "something came down," followed by pain and bleeding. This state of affairs continued for five days, during which time the bowels were opened once and flatus passed freely.

Examination (Jan. 10).—The patient was thin, with good color but a dry, dirty tongue. There were no abnormal signs in the abdomen and no signs of intestinal obstruction. There was an intussusceptum 6 inches (15 cm.) in length protruding from the anus. The protruding bowel was edematous and friable, with ulceration of parts of the mucosa. Examination caused considerable bleeding and severe pain.

Operation.—With the patient under general anesthesia (pentothal, flexadil, ether and oxygen) the diagnosis of sigmoidorectal intussusception was confirmed. Inside the intussusceptum, detected by palpation, was a small hard ulcerating carcinoma about ½ inch (10.64 cm.) in diameter. The anal sphincters were dilated and reduction attempted, without success. Accordingly a left lower paramedian incision was made but reduction by traction from above was also unsuccessful until combined with manipulation from below. By this maneuver, except for some tearing of the peritoneum, the bowel was delivered intact, and it was then seen that there was a highly mobile sigmoid loop with a long mesentery. The neoplasm was at the juncture of the upper and middle thirds of the sigmoid loop. There was gross edema of the bowel and mesentery below the growth, and the viability of much of this segment was doubtful. There was no enlargement of the regional lymph glands, and no palpable secondary growths were present in the liver. The growth, together with a wedge of mesentery, was resected but, owing to the doubtful viability of the distal bowel, the resection had to be more extensive than is usual with a Paul's resection—direct anastomosis was out of the question, owing to the edematous nature of the lower segment—and only with difficulty could the distal portion be brought out of the lower end of the incision, immediately above the pubis. The upper limb of the double-barreled colostomy was mobilized and loosely sutured to the lower limb. The wound was closed with a drain running down

---

Submitted for publication April 1, 1955.

to the pelvis by the side of the lower limb of the colostomy. Approximately 10 inches (25 cm.) of colon was removed.

Pathologic Diagnosis (Dr. F. W. Vint).—The pathologic diagnosis was adenocarcinoma invading the muscular layer of the intestine but not reaching the peritoneum.

Postoperative Course. — The convalescence was stormy, with intermittent vomiting and signs of obstruction which responded partially to gastric suction and intravenous fluids but culminated in total obstruction of the small bowel. On January 29 the abdomen was opened again through a right paramedian incision. Dilated small bowel was followed to the region of the colostomy, where it was involved in a complex mass of adhesions. The loops were freed, found viable and returned. Subsequent progress was rapid, with colostomy action and oral feeding proceeding normally. The colostomy spur was crushed with an enterotome on February 14. Normal bowel action occurred on February 18, and on February 23, when the patient was discharged, most of the feces were being passed per rectum. The patient failed to report for review on several occasions but was eventually traced and readmitted for operative closure of the colostomy on October 27. At this time she felt well, had gained 1 stone (14 pounds) in weight and was not worried by the occasional action of the colostomy. Extraperitoneal closure of the colostomy was performed on Oct. 28, 1951. The wound healed by first intention, the bowels opening on the fifth day, and function subsequently was normal. When last seen (in December 1954) the patient had gained 7 pounds more in weight, bowel action was normal and there was no evidence of metastatic spread or local recurrence.

COMMENT

This case is interesting because of its unusual nature, because of the stoicism with which the patient suffered her complaint without seeking medical advice, and from the point of view of treatment.

Such a condition can occur only with a redundant sigmoid loop, a small neoplasm and the lax anal sphincters most commonly observed in elderly persons.

Bailey (1946) described a case of his own and cited one of Cope's (1928) of sigmoidorectal intussusception. In both of these the condition occurred in elderly patients, but in neither was there any evidence of a predisposing tumor. In Bailey's own patient, a woman aged 88, the bowel had been down for only two hours and was easily reduced without resorting to operation. In Cope's patient, a man aged 82, the bowel had been evaginated for six days (c.f. five days in the present case). In the latter case manual reduction failed, as did attempted reduction at laparotomy, but after colostomy there was spontaneous reduction and, as a result, colostomy alone was tentatively suggested as a definitive treatment. In both cases there was spontaneous recovery.

Welsh (1952) reported 2 cases of recovery following spontaneous separation of gangrenous sigmoidorectal intussusception but gave no cause for the intussusception.

Rose (1945) reported a similar but not exactly comparable case in which resection was performed. In his case, however, the intussusception was due to a benign polyp; there was a coincident ring carcinoma proximal to the polyp, with intussusception; and the intussusception, although it could be palpated *per rectum*, did not protrude from the anus.

Guibal (1938) recorded 2 cases of sigmoidorectal intussusception. In 1 case it was due to a simple polyp and in 1 to a carcinoma, but, as in Rose's case, although the growths were palpable in the rectum they were not extruded through the anus.

Lichtenstein and Ulin (1951) referred to treatment. In the case they describe the patient was 80 years old and on admission was in a critical condition owing to hemorrhage from the prolapsed bowel. No major surgical procedure was attempted; instead, the whole mass was encircled by two stout ligatures. This stopped the hemorrhage and the patient improved remarkably, but unfortunately a redundant loop of sigmoid colon which had descended in front of the rectum into the rectovesical pouch was included in the ligatures, with fatal consequences. In the same article these authors referred to the danger of an "amputation" type of operation (illustrated by a case of intussusception of the distal limb of a colostomy, in which leakage occurred at the suture line).

Reduction in the present case was impossible from below or above, but a combined maneuver was successful, with only minor damage to the bowel, and permitted adequate "curative" resection.

SUMMARY

A case is reported of sigmoidorectal intussusception, with protrusion of the bowel through the anus, in a woman aged 60. The condition was due to carcinoma of the sigmoid. Such a condition, the authors state, can occur only in the presence of a redundant sigmoid loop, a small neoplasm and the lax anal sphincters commonly encountered in the elderly and the aged. Reduction in the authors' case was impossible either from below or from above, but a combined maneuver was successful and permitted adequate resection, with only slight damage to the bowel.

ZUSAMMENFASSUNG

Es wird über einen Fall von sigmoideorektaler Invagination mit Vorstülpung des Darms durch den After bei einer 60 jährigen Frau berichtet. Die Erkrankung war die Folge eines Krebses des Colon sigmoideum. Die Verfasser bemerken, dass ein solcher Zustand nur entstehen kann, wenn eine übermässig lange Sigmoidschlinge besteht, die Neubildung klein ist und der Schliessmuskel des Afters eine Schlaffheit aufweist, der man im allgemeinen bei älteren oder alten Leuten begegnet. Im Falle der Verfasser war eine Reduktion weder von unten noch von oben möglich. Ein kombiniertes Vorgehen war jedoch erfolgreich und ermöglichte eine ausreichende Resektion mit nur geringfügiger Verletzung des Darmes.

RÉSUMÉ

Un cas c'intussusception sigmoido-rectale est reporté, avec protrusion de l'intestin à travers l'anus chez une femme agée de 60 ans. La cause de la protrusion était un carcinome du Colon sigmoide. L'auteur constate, qu'une telle condition peut seulement se développer en présence d'un lacet sigmoidale relâché, d'un petit néoplasme et des muscles sphincteriques relâchés, comme on le trouve ordinairement chez les gens agés. Dans le cas de l'auteur une correction, soit du haut ou du bas était impossible, mais un manoeuvre combiné fut suvi de succès, de sorte, qu'une résection suffisante était possible avec peu de dommage a l'intestin.

RIASSUNTO

Viene riferito un caso di invaginazione sigmoidorettale, con protusione dell'intestino dall'ano, in una donna di 60 anni. La causa era data da un carcinoma del sigma. Tale condizione si può verificare solo in presenza di un ansa sigmoidea lunga con un piccolo neoplasma ed uno sfintere anale rilassato quale si riscontra nelle persone anziane e vecchie. Nel caso dell'autore fu impossibile la correzione sia da sotto che da sopra, ma una manovra combinata ebbe esito soddisfacente e permise una adeguata resezione, con un minimo di danno per l'intestino.

BIBLIOGRAPHY

Bailey, H.: Emergency Surgery. Bristol: John Wright & Sons Ltd., 1946.

Cope, V. E.: Clinical J. 57:547, 1928.

Guibal, A.: Rev. med. Nancy 66:177, 1938.

Lichtenstein, I. L., and Ulin, A. W.: Surgery 30:456, 1951.

Rose, B. T.: Brit. J. Surg. 33:182, 1945.

Welsh, F.: Lancet 2:518, 1952.

Basic Anatomic Principles of Fistula Surgery

HAROLD COURTNEY, B.S., M.D., M.Sc. (Med.),
F.I.C.S., F.A.P.S., D.A.B.

SYRACUSE, NEW YORK

THERE are certain anatomic principles of the surgical treatment of fistula that must be followed in order to obtain the best functional result. The anorectum is one region of the human body to which the usual surgical principles of abscess treatment do not apply: (1) one never waits for an abscess to point, and (2) the incisions must be placed in relation to the site selected for the secondary cutaneous opening, rather than at the spot where the abscess may tend to point. Intralevator and supralevator abscesses never point externally unless there is secondary involvement of the superficial spaces (ischio-anal fossae). These deep abscesses break from one anatomic space into another and tend to point through the rectal wall, between or even above all the layers of the anorectal sphincter musculature.

A fact that must be recognized and accepted is that the acute abscess represents the third stage in the development of a fistula. About 98 per cent of all abscesses in the anorectal area are fistulas of which the primary opening is in an anal crypt, fissure or ulcer.

The primary opening (internal) must be found and removed, together with all fistula tracts.

It is always easier to locate the primary opening at the time the primary abscess is uncapped than at the subsequent fistulectomy.

Once the diagnosis of an acute abscess is made, the sooner the abscess is uncapped the better.

When a large, deep abscess is present, the actual fistulectomy should be postponed for one or more weeks, until acute inflammation has subsided. At the end of this time practically all coexistent anorectal pathologic tissue may be safely excised along with the fistula. The small abscess with a superficial fistula, however, can be operated on in one stage.

An anorectal abscess should be uncapped (or unroofed), not incised and drained as is so frequently recommended.

All wounds must be adequately saucerized. This applies to the fat of the ischioanal fossa and to the mucous membrane and skin of the tract margin. The sphincter musculature must not be excised in the process of saucerizing the wounds.

Wounds should be kept apart with Penrose drains and extremely loose packing.

All packing should be removed from fistula wounds within twenty-four hours and from the most extensive abscess cavities within forty-eight to seventy-two hours.

Once the packing has been removed, it should never be replaced. The wounds should be kept apart and made to heal from the bottom up by lightly drawing a sterile gloved finger along the base of the entire wound at intervals of three to five days. Bridging and superficial healing must be prevented by the aforedescribed technic.

As to the terms "fistulectomy" and "fistulotomy," the distinction is as follows: Fistulectomy, implying complete excision of the fistula tract, should never be performed on that portion of the pathway

---

Read at the Twentieth Annual Congress of the United States and Canadian Sections, International College of Surgeons, Philadelphia, Sept. 12-15, 1955.
Submitted for publication Sept. 14, 1955.

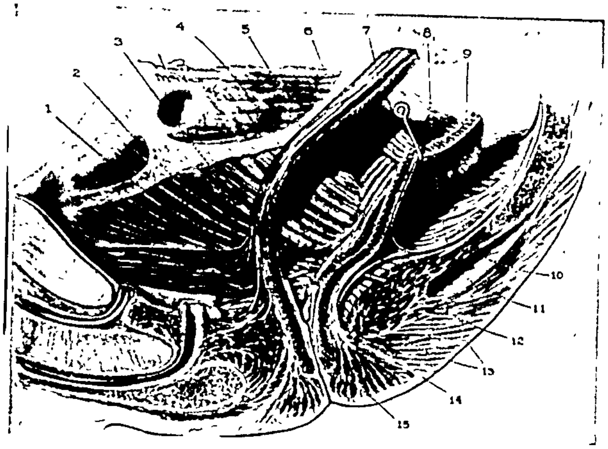


Fig. 1.—Drawing of midsagittal section, somewhat schematic, showing the relation of the anorectum to the pelvic diaphragm and the anorectal musculature. A window has been cut through the lateral wall of the rectum, layer by layer, to show the relation lateral to the rectum. (Dissection by the author.) Superior layer of the levator shows at 4-8; inferior layer, at 2-7-10-12; posterior levator space at 3; retrorectal space at 9; posterior subsphincteric space at 11, and deep external sphincter muscle at 13 and 14. *1*, combined longitudinal muscle layer (anterior to rectum). This layer is composed of the longitudinal muscle layer of the rectum, fibers from levator fascia and fibers from both superior and inferior layers of levator. *2*, inferior layer of puborectalis muscle. *3*, arrow lying in posterior levator space, which surrounds rectum like a horseshoe, with open end of horseshoe toward pubis. *4*, superior layer of levator muscle. *5*, combined longitudinal muscle layer of rectum (posterior to rectum). *6*, fiber from superior layer of levator to combined longitudinal muscle layer of rectum. *7*, inferior boundary of posterior levator space formed behind rectum by superior surface of coccygeal muscular raphe. *8*, iliorectococcygeus muscle formed by fibers from the iliococcygeus (striped), fibers from longitudinal muscle layer of rectum (smooth) and a few fibers from levator fascia. This muscle forms superior boundary of posterior levator space, behind rectum. *9*, retrorectal space. *10*, coccygeal muscular raphe attached to tip and sides of coccyx. *11*, posterior subsphincteric space (connecting the two ischioanal fossae). *12*, puborectalis muscle (sling of puborectalis behind rectum). *13*, fibers of deep external anal sphincter muscle, with insertion into skin along anococcygeal skin sulcus. *14*, deep external anal sphincter muscle (posterior to rectum). *15*, anal intermuscular septum.

which traverses the sphincter musculature. It should be reserved for those portions of the fistula which lie external to it. Fistulotomy, or the splitting open of the tract (plus thorough curettement of its base), should be performed on all portions of the tract that pass through the sphin ter musculature. It may likewise be a plied to the entire fistula, if desired.

In cases of extensive, complicated, dee fistulas for which a multiple-stage pr cedure may become necessary, it is fa better to start the fistulectomy from th secondary cutaneous opening and wor toward the primary opening than it is t proceed *vice versa*. The instant a fistulec

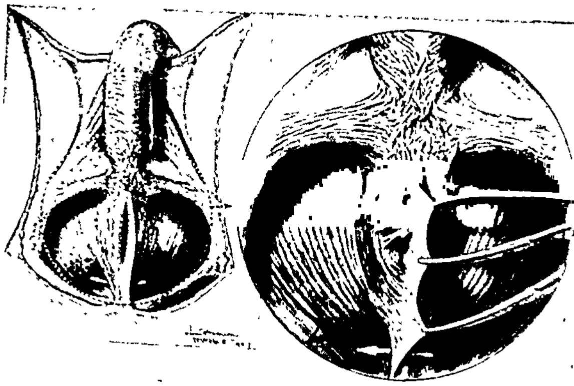


Fig. 2.—*A*, drawing of dissected male pelvis, perineal view, showing (1) relation of levator muscle and perineal muscles to deep and subcutaneous external sphincter muscles of anus, (2) attachments of combined longitudinal muscle layer of rectum to dermis, and (3) surface view of central tendinous point of perineum. (Dissection by the author). The arrow passes through posterior subsphincteric space lying between inferior surface of coccygeal muscular raphe superiorly, and posterior attachments of deep external sphincter muscle into dermis inferiorly. *B*, enlargement showing that skin stretched with three hemostats to demonstrate attachments of subcutaneous and deep external sphincter muscles into skin along the anococcygeal cutaneous sulcus posteriorly and along the anal-scrotal raphe anteriorly; also attachments of layers of combined longitudinal muscle layer of rectum as they separate individual muscle bundles of subcutaneous sphincter and are inserted into dermis, forming corrigator muscle of anal skin. Heavier layer, forming outer sheath of subcutaneous sphincter muscle and separating it from deep external sphincter muscle, is shown as heavy white line. Anteriorly, cut-off ends of muscle fibers from their cutaneous attachments "stand out." Manner in which muscle bundles from both subcutaneous and deep portions of external sphincter muscle (from same and opposite sides), pass to their various attachments, is shown as follows: (1) to raphe of bulbocavernosus muscle, (2) to help form bulbocavernosus, and (3) to help form superficial transverse perineal muscles. For clarity, muscle bundles with insertions into the anal fascia and those traversing the fat of the ischioanal fossa could not be illustrated in this drawing.

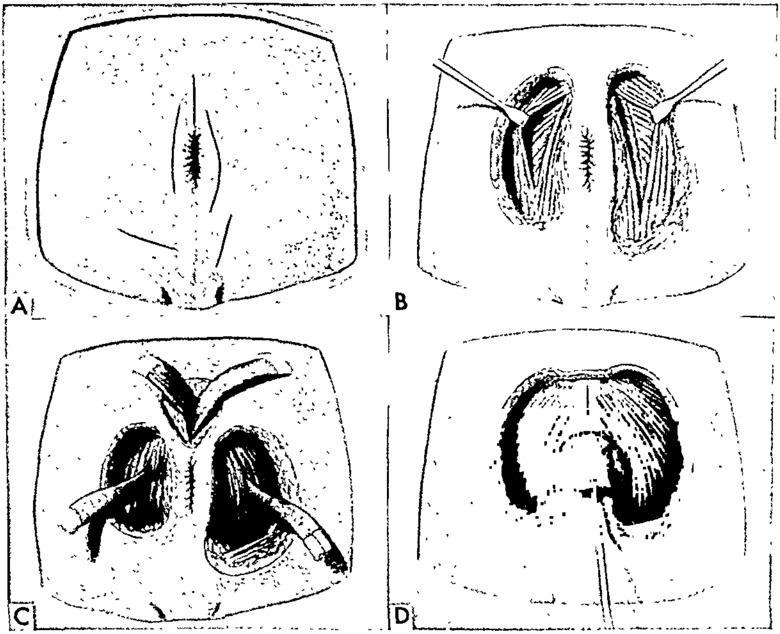


Fig. 3.—Operative technic. Drawings *B*, *C* and *D* are somewhat schematic, as an excess of fat was removed from each ischioanal fossa. Patient is lying in inverted or jack-knife position. *A*, location and extent of various incisions used for exploration and counterdrainage of deep perianorectal fistulas; three incisions are devised on an anatomic basis to preserve attachments of anorectal sphincter musculature. *B*, drawing showing second step of actual operation and demonstrating relations of deep external anal sphincter and those of lateral extensions of posterior levator space lying between inferior and superior layers of levator muscle. On patient's left, inferior layer of levator has been divided and lateral portion of muscle has been pulled upward and outward with hook, exposing lateral extension of posterior levator space. On patient's right, superior layer of levator has been incised, which has laid open the pelvirectal space. Patient is laying in inverted or jack-knife position. *C*, drawing showing third step of actual operation (made somewhat schematically in that an excess amount of fat has been removed from each ischioanal fossa) to show relation of deep external anal sphincter muscle, levator muscle and superficial transverse perineal muscle (shown in anterior portion of uncapped abscess wound on patient's right. Patient lying in inverted or jack-knife position). The method of passing drains from primary posterior exploratory incision through abscess cavities in posterior levator, retrorectal and pelvirectal spaces and out through lateral counterdrainage incisions is illustrated. Drains should be fastened external to the wounds. *D*, use of posterior horseshoe incision which should be reserved for occasional cases of chronic fistula in which it is the only means possible, to secure adequate exposure for excision of fistulous tract and cleaning of old abscess cavity remaining in posterior levator or retrorectal spaces. Transverse part of incision should be made well back toward tip of coccyx, and skin containing insertions of deep external sphincter muscle should be reflected anteriorly as shown. Incision is carried superiorly to bottom of posterior subsphincteric space (i. e., to inferior surface of the coccygeal muscular raphe). By preserving attachments of deep external anal sphincter muscle to skin, better sphincter control can be maintained than when muscle is divided close to anus. Coccygeal muscular raphe is shown in drawing as white fibrotendinous area extending from reflected skin flap posteriorly to tip of coccyx. Note manner in which its fibers are separated rather than severed by primary posterior midline exploratory incision. Surgeon must use own discretion as to manner in which the coccygeal muscular raphe is handled. If this structure is completely severed transversely, the main anchoring support of anorectum posteriorly is destroyed; anus will become displaced forward and inward, with marked deformity, and severe loss of sphincter control will usually result. (From Courtney, H.: Am. J. Surg. 79:155-173, 1950).

tomy is started at the primary opening the privilege of performing a staged procedure is lost and the patient may suffer consequently, an undue loss of sphincter control, as a result.

Whenever possible, the sphincteric fibers should be severed at a right angle to their course.

Antibiotic therapy has no place in the treatment of these conditions prior to operation.

It is just as much a mistake to prescribe sedatives for pain prior to the time the patient consents to the necessary surgery, as it is in the case of the acute abdomen.

Anorectal abscesses and fistulas occur (1) below the levator muscle; (2) between the layers of the levator muscle, and (3) above the levator muscle.

1. All abcesses and fistulas that occur below the levator muscle (inferior) fall into two main categories: (a) the straight or slightly curved fistula, which is usually of the simple variety and presents no problem, since as a rule only the subcutaneous and, occasionally, the lower edge of the internal sphincter are severed; (b) the posterior or anterior horseshoe fistula, which, although of the simple variety, presents slightly more of a problem. In the presence of posterior horseshoe fistula, the pathway from one ischio-anal fossa to the other, is by way of the posterior subsphincteric space. Its location is superficial or inferior to the main portion of the levator muscle (coccygeal muscular raphe), which is attached to the tip and sides of the coccyx. With an anterior horseshoe fistula the pathway across the midline is usually deep (*not* superficial, as is so often stated in textbooks and in the literature) and follows the fibers of the deep external sphincter muscle as they decussate through the central tendinous area (point) of the perineum.

2. The abscesses and fistulas which occur within the levator muscle.

3. Those which occur above it. These are occasionally more or less simple, but as a rule they are complex and at times tax all the ingenuity, skill and anatomic knowledge of the surgeon.

As to orientation while operating: All deep abscesses and fistulas should be opened and explored under direct vision, layer by layer, with skin and wound retraction and identification of the various muscle layers as they are incised. Posteriorly, the tip of the coccyx serves as the main landmark, posteriorly. It should be felt for with the index finger as the wound is deepened and its location kept in mind.

When abscess and fistula tracts involve the posterior subsphincteric space (*11*, Fig. 1), if the bottom or base of the wound is explored with the index finger, one will find that one is superficial to the inferior layer of the levator, which is firmly attached to the tip and sides of the coccyx.

In abscesses of the posterior levator space (*3*, Fig. 1) the surgeon's index finger is in the abscess cavity, and he can only palpate the tip of the coccyx and its anterior surface for a distance, perhaps, of ¼ to ¾ inch (0.6 to 1.9 cm.), at which point he is stopped by the insertion of the superior layer (*8*, Fig. 1). Of course, if the abscess extends into one or both lateral extensions of this space (*3*, Fig. 1) the finger can be passed around one or both sides of the rectum, occasionally almost as far anteriorly as the pubis. I have observed several cases in which abscesses of the lateral extensions of the posterior levator space had been incised through the vagina; needless to say, without curing the patient and making the necessary surgical procedures more difficult.

If the retrorectal space is involved (*9*, Fig. 1) the surgeon will be able to insert his finger from one to several inches upward, along the anterior surface of the coccyx and sacrum. Abscesses of the retrorectal space are prone to rupture through the rectal stalks into either or both pelvirectal spaces and *vice versa;* therefore, one must always search for such extensions.

The acute abscess, operated on for the first time, has never confronted me with any problem, either at the time of uncapping or at the subsequent fistulectomy. The old recurring abscessed fistula involving the deep spaces, however, has frequently taxed all my ingenuity. It is in such cases that anatomic knowledge and past experience are the surgeon's best allies.

In the past, whenever a writer referred to a posterior horseshoe fistula, he always referred to one involving the two ischioanal fossae, with the entire horizontal plane of the fistula below the levator muscle. Within my knowledge, no one has *demonstrated the fact that two additional* types of horseshoe fistula occur posterior to the rectum, each on a different horizontal plane as related to the levator. There *is the fistula of the horseshoe-shaped pos*terior levator space, which forms between the two layers of the levator muscle and the supralevator posterior horseshoe fistula, and occurs when abscesses break through from the retrorectal space into the right and left pelvirectal space and *vice versa.* In other words, a posterior horseshoe fistula may occur (1) below, (2) *within and* (3) *above the levator* muscle.

Whenever one cuts through the fleshy belly of a muscle one destroys to a marked degree its power to contract after healing. It is to the advantage of rectal surgeons, therefore, to divide sphincter muscles as near their points of insertion as possible, since many of their fibrotendinous terminations have little power of contraction (Fig. 2).

On the basis of the aforementioned anatomic contentions, verified by my own experience, the following locations, in the order mentioned, offer the smallest loss in sphincter control when the muscles are divided (Fig. 2).

1. Posterior midline
2. Both posterolateral quadrants
3. Anterior midline
4. Both anterolateral quadrants
5. Both lateral quadrants

Complete severing of the anorectal muscular ring in one stage results in loss of bowel control ranging from marked to complete. If ⅛ to ¼ inch (0.32 to 0.64 cm.) of the ring can be preserved, an appreciable amount of bowel control will be maintained.

In the surgical treatment of the chronic fistula, even though it is necessary to lay open the entire tract, there are times when one can alter the incisions, through and between the various muscle layers, to conform with the basic principles outlined in this article. *A, B, C* and *D,* Figure 3, show the various locations of the drainage and counterdrainage incisions and also the manner in which anorectal abscesses are uncapped.

SUMMARY

1. The fundamental anatomic and surgical principles of the surgical treatment of perianorectal abscess and fistula are presented, on the basis of common knowledge and the author's personal experience.

2. A simple, practical, operating-room classification of abscesses and fistulas is presented, on the basis of their relation to the two layers of the levator muscle and the tip of the coccyx.

3. *Drainage and counterdrainage incisions* devised by the author on an anatomic basis to preserve the attachments of the anorectal sphincter musculature are illustrated and discussed.

4. The resultant sphincter control, as applied to the location at which the sphincter has been divided, is recorded according to the author's experience.

CONCLUSION

It is obvious that the better the surgeon's knowledge of detailed anatomy and the basic principles of fistula surgery, the better will be the cosmetic and functional results. If the aforementioned basic principles are followed in every case of fistula, provided the patient does not have a chronic condition that interferes with healing, there is no reason why every fistula should not be cured at the first operation.

ZUSAMMENFASSUNG

Der Verfasser gibt eine sich auf allgemein anerkanntes Wissensgut und auf eigene Erfahrungen stützende Darstellung der anatomischen und chirurgischen Grundlagen der chirurgischen Behandlung perianorektaler Abszesse und Fisteln.

Er gibt eine einfache und praktische für den Operationssaal geeignete Einteilung der Abszesse und Fisteln auf Grund ihrer Beziehungen zu den beiden Schichten des Levatormuskels und zur Steissbeinspitze.

Die vom Verfasser eingeführten Einschnitte zur Drainage und Gegendrainage beruhen auf anatomischer Grundlage und berücksichtigen die Erhaltung der Ansatzstellen der anorektalen Sphinktermuskulatur. Sie werden illustriert und erörtert.

Die Resultate hinsichtlich der Sphinkterkontrolle werden je nach der Stelle, an der der Sphinkter durchschnitten wurde, nach den Erfahrungen des Verfassers wiedergegeben.

SCHLUSSFOLGERUNGEN

Es zeigt sich, dass die kosmetischen und funktionellen Ergebnisse umso besser sind, je enger der Chirurg mit den anatomischen Einzelheiten und mit den Grundsätzen der Chirurgie von Fisteln vertraut ist. Wenn die dargestellten Grundsätze in jedem Fall befolgt werden, ist nicht einzusehen, warum nicht jede Fistel mit dem ersten operativen Eingriff geheilt werden kann, vorausgesetzt dass der Kranke nicht ein chronisches Leiden hat, das den Heilungsvorgang beeinträchtigt.

SUMARIO

Os principios fundamentais anatômicos e cirurgicos do tratamento cirurgico dos abscessos e fístulas e fístulas perianoretais são apresentados, sôbre bases do conhecimento geral e da experiência do autor.

Uma classificação simples e prática de abcessos e fístulas é apresentada, baseada nas relações com os dois planos do músculo elevador e a ponta do coccyx.

As incisões de drenagem e contra drenagem idealizadas pelo autor com bases anatômicas para preservar a função da musculatura do esfinter anorretal são ilustradas e discutidas.

O resultado do controle esfinteriano, é registrado de acordo com a experiência do autor.

CONCLUSAO

É obvio que, tanto melhor o conhecimento pelo cirurgião da anatomia e dos principios básicos de cirurgia das fístulas melhor será o resultado cosmético e funcional.

Se os principios básicos são observados em cada caso, se o paciente não tiver outra condição cronica que interfira na cura, não há razão para que a fístula não seja curada na primeira intervenção.

RÉSUMÉ

Les principes fondamentaux anatomiques et chirurgicaux du traitement chirurgical de l'abscès et de la fistule periano-rectale sont presentés sur la base du savoir général et de l'expérience de l'auteur.

Une classification simple, prâtique des abscès et fistules est presentée pour la salle d'opération, basée sur leurs rélations au deux plaines du muscle levateur et la pointe du coccyc.

Des incisions pour drainage et contre drainage, expliquées par l'auteur sur une base anatomique de conserver les attachements de la musculature anorectale sont illustrées et discutées. Le contôle sphinctérique résultant, dépendant de la place, ou let muscle était coupe, est noté d'après l'expérience de l'auteur.

CONCLUSIONS

Il est clair que, meilleur est le savoir de l'opérateur, en ce qui concerne l'anatomie détaillée et les principes basiques de la chirurgie des fistules, meilleurs seront les résultats cosmétiques et fonctionaux. Si les pricipes mentionés ci-devant seront suivis dans chaque cas de fistule, pourvu que le malade ne souffre d'une condition chronique, qui empèche la guérison, il n'y a pas de raison que la fistule ne serait pas guérie par la première opération.

RIASSUNTO

1. Vengono descritti i principi fondamentali per la cura chirurgica degli ascessi perianorettali e delle fistole di questa regione, in base alla pratica comune e alla esperienza personale.

2. Viene fornita una semplice e pratica classificazione degli ascessi e delle fistole sulla base dei loro rapporti con i due piani del muscolo elevatore e con l'apice del coccige.

3. Vengono descritte le incisioni e le controincisioni ideate secondo criteri anatomici e tali da risparmiare l'inserzione dello sfintere.

CONCLUSIONI

É ovvio che quanto più approfondita è la conoscenza anatomica della regione tanto migliori saranno i risultati dal punto di vista cosmetico e funzionale. Se in ogni caso di fistola si seguiranno i principi esposti, a condizione che non vi siano affezioni croniche che si oppongano alla guarigione, si potrà ottenere il miglior risultato fin dal primo intervento.

BIBLIOGRAPHY

Courtney, H.: (a) Anatomy of the Anorectal and Perianorectal Areas (as Related to the Spread of Infection by Contiguity). Thesis, University of Pennsylvania, 1940. (b) The Posterior Levator Space (Its Relation to Postanal Infection), Tr. Am. Proct. Soc. 45:450-455, 1946. (c) Posterior Levator Space Abscess, Am. J. Surg. 75:405-412, 1948. (d) Abscess of the Deep Perirectal Spaces: Their Significance, Diagnosis and Treatment, New York State J. Med. 47:2552-2559, 1947. (e) The Posterior Subsphincteric Space—Its Relation to Posterior Horseshoe Fistula, Surg., Gynec. & Obst. 89:222-226, 1949. (f) Anatomy of the Pelvic Diaphragm and Anorectal Musculature as Related to Sphincter Preservation in Anorectal Surgery, Am. J. Surg. 79:155-173, 1950.

* * *

Inventive genius requires pleasurable mental activity as a condition for its vigorous exercise. "Necessity is the mother of invention" is a silly proverb. "Necessity is the mother of futile dodges" is much nearer to the truth. The basis of the growth of modern invention is science, and the science is almost wholly the outgrowth of pleasurable intellectual curiosity.

Primary Metastasis to Scalp from Rectal Adenocarcinoma

LESTER I. JOHNSON, M.D., F.I.C.S., D.A.B.
SAN JOSÉ, CALIFORNIA

THE proper management of malignant disease in this era rests primarily in the field of roentgenology, in which the therapeutic rays emanating from the roentgen tube or from radium are used, and in surgical intervention. Surgical treatment of primary lesions has not been a serious problem in the majority of cases, but surgical cure or prevention of metastases has remained a puzzling, serious and often exasperating task. As medical history is recorded, undoubtedly future generations will look back at today's feeble attempts to cure cancer by surgical means with the same amusement with which our generation looks back at blood-letting and the same horror with which it recalls the preanesthetic era. However, both surgical intervention and the roentgen ray have been of great benefit to many sufferers of malignant disease and will be used henceforth until science provides us with more definitive measures.

The case here reported illustrates the unusual spread of an adenocarcinoma of the rectum to the scalp. The literature reveals only 1 such case. It was reported by Willis, then of Melbourne, Australia. In Willis' case a solitary scalp metastasis arose from a mucoid carcinoma of the colon. Although metatases to the lymph nodes and internal organs are frequent, metastases to the skin are infrequent and cutaneous metastases on the scalp are rare.

Kaufman and Wolf mentioned 1 case, of 65 cases of cutaneous metastases, in which the scalp was involved.

Symmers reported that among 298 cases of malignant tumor, of which 220 showed metastases, a solitary metastatic tumor was located in the scalp in 3 instances.

Goldsmith observed small metastatic nodules in the scalp of a 70-year-old woman who was later discovered to have a carcinoma of the breast. Gates also reported cases of metastatic lesions in the scalp from primary cancer of the breast.

Robinson and Castelman reported a scalp nodule in 1 case. The patient died of a hemangioma twenty-one months later.

Fay and Henry reported 1 instance of metastasis to the scalp—a single subcuta-

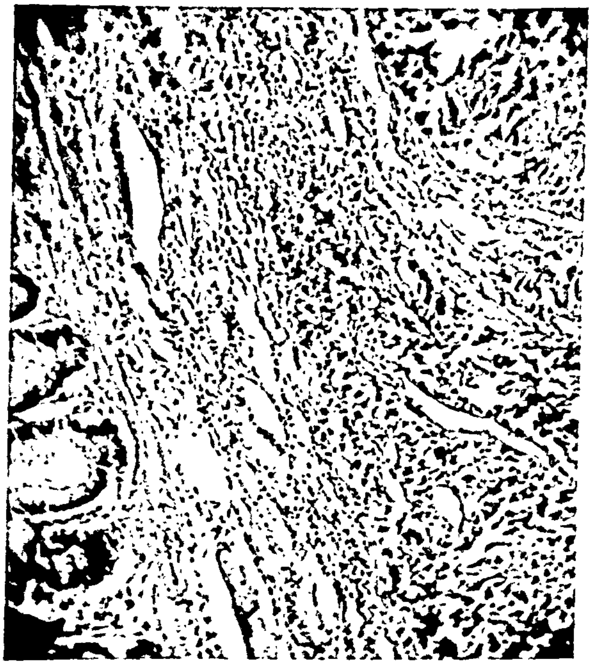


Fig. 1.—Adenocarcinoma of rectum.

Read at the Twentieth Annual Congress of the United States and Canadian Sections, International College of Surgeons, Philadelphia, Sept. 12-15, 1955.
Submitted for publication Nov. 30, 1955.

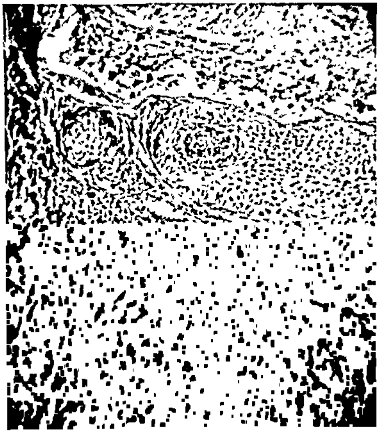


Fig. 2.—Metastatic adenocarcinoma of scalp tissue. (low power magnification).

neous nodule from a hypernephroma. Sutton and Sutton, in publishing their book, included pictures of metastatic lesions in the scalp observed before any symptoms of hypernephroma had developed. Halstead amputated a femur for pathologic fracture, and later a mass in the scalp was removed as a "wen." Both growths proved to be hypernephromatous, and hematuria and a palpable renal tumor subsequently appeared.

Sequeira reported metastatic growths in the scalp secondary to a chondrosarcoma of the foot.

Ronchese reported a case of carcinoma of the prostate in which, later, primary metastases to the scalp were noted.

Montgomery performed biopsies of scalp tumors, which had obviously originated from a primary carcinoma of the left lung.

Neurogenic sarcoma arising in the popliteal space was observed by Stewart and Capeland to have spread metastatically to the scalp.

Ahnlund of San José had a patient with Ewing's tumor of the ilium, in which later a metastatic nodule appeared in the scalp.

Although many extensions of skull tumors into the scalp could be cited, they are outside the scope of this article.

REPORT OF CASE

A 57-year-old woman had a tumor in the posterior wall of the rectum, involving approximately half the rectal circumference. Biopsy of this tumor revealed it to be adenocarcinoma.

Barium enema roentgenogram was reported as normal except for minimal diverticulosis in the distal, transverse and descending portion of the colon.

Abdominoperineal resection and left rectus colostomy were performed. The gross specimen confirmed the observations at biopsy, and a survey of the lymph glands revealed no spread to those adjacent to the tumor site.

Six months of normal convalescence ended when the patient presented herself at my office, complaining of a "wen" on the scalp. She was advised to have it removed and instructed to call for a scheduled date. It was a month later when she revisited me, and at

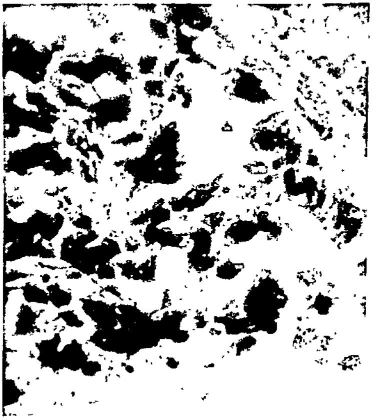


Fig. 3.—Me [illegible] rcir
sue ([illegible]

that time there were several "wens." Roentgenograms of the skull failed to reveal any bony changes, and thoracic films revealed no abnormality. Four days later six small lesions were removed from the scalp, and all specimens showed metastatic adenocarcinoma.

The patient died two months later, after a rapid extension of metastases to the cervical glands. Permission for autopsy was not granted. There was no evidence of hepatic involvement, however, and no internal organs showed embarrassment from an invading tumor.

COMMENT

The mode of metastasis from the rectum to the scalp may be postulated as transpulmonary or via the vertebral system of veins as reported by Batson in 1940.

Zeidman and Buss, experimenting to determine whether emboli of tumor cells pass unarrested through the lungs, used a suspension of cancer cells injected into a vein while, simultaneously, the aortic blood of the experimental animal was collected. The aortic blood was then injected intravenously into a second animal. Tumors developed in the second animal, which indicates that the embolic cells had passed immediately through the lungs of the first animal. Immediate transpulmonary passage of tumor cell emboli occurred with all three types of cancers employed. The injection of aortic blood led to tumor formation in 10 out of 20 experiments with Brown-Pearce carcinoma, 2 out of 15 with V_2 rabbit carcinoma, and 1 out of 11 with Walker rat carcinoma 256. There remains the possibility that in these experiments tumor cell emboli passed through an arteriovenous anastomosis or a patent foramen ovali. Such a passage is considered unlikely. It is noted that none of the metastatic tumors developed in the scalp when cancer cells of these three types were used.

Batson has shown that tumor cells arising in the lower part of the pelvis travel by way of the vertebral veins. He stated that by the Valsalva maneuver—"compression of the chest and abdomen with the larynx and other sphincters closed"—not only is the blood prevented from entering the chest by way of the veins, but it is actually squeezed out of the intra-abdominal veins into the vertebral system.

Walther has expressed the opinion that metastases are carried by lymphatic channels only as far as the regional lymph nodes and from that point are spread by the blood vascular system.

Again, Batson described a vast intercommunicating system of veins that is constantly and physiologically the site of frequent reversal of flow. During such a reversal a pathway exists up and down the spine without involving the heart or the lungs. The pathway has many connections. "It provides a ready vehicle for the explanation of aberrent metastatic patterns and removes the stumbling block of the absence of lung involvement. The course through an open foramen ovali, while still a possible path, is no longer necessary to explain this lung paradox."

In reviewing the case reported in this paper, it seems impossible to estimate the method of metastasis from the primary colonic cancer to the scalp, for there are three facts that stand out: 1. There was no involvement of lymph glands near the tumor. 2. There were no metastases to the lungs. 3. Roentgenograms of the skull revealed no abnormality when the secondary growths appeared in the scalp. Perhaps, since the patient was a cigaret smoker with a chronic cough, she had been practicing the "Valsalva maneuver" repeatedly, and the tumor's spread via the venous system described by Batson seems most reasonable.

SUMMARY

The author reports an unusual case of metastasis to the scalp from an adenocarcinoma of the rectum. His search of the

literature revealed only 1 other such case. Although metastases to the lymph nodes and internal organs are frequent, metastases to the skin are uncommon and metastases to the scalp are rare.

In the case reported the lymph glands in the neighborhood of the tumor were not involved; there were no metastases to the lungs, and roentgenograms of the skull taken at the time when the secondary growths appeared in the scalp revealed no abnormality.

ZUSAMMENFASSUNG

Der Verfasser berichtet über einen ungewöhnlichen Fall einer von einem Adenokarzinom des Mastdarms ausgehenden Metastase im Skalp. Seine Nachforschungen in der Literatur ergaben nur einen anderen Fall dieser Art. Während Metastasen in den Lymphknoten und in inneren Organen häufig sind, sind sie in der Haut ungewöhnlich und im Skalp selten.

Im vorliegenden Falle waren die Lymphknoten in der Umgebung der Geschwulst nicht befallen; es lagen auch keine Lungenmetastasen vor, und die zur Zeit des Auftretens der sekundären Geschwulst angefertigten Röntgenaufnahmen des Schädels ergaben keine krankhaften Befunde.

RÉSUMÉ

L'auteur reporte un cas étrange de metastase au cuir chevelu d'un carcinome du rectum. À la recherche de la littérature il a trouvé seulement un cas pareil. Malgré que des metastases au glandes lymphatiques et aux organes internes sont trouvées souvent, des metastases dans la peau sont peu communes, et celles dans le cuir chevelu sont très rares.

Dans le cas reporté les glandes lymphatiques dans les environs du tumeur n'étaient pas envahies, il n'y avait pas de metastases aux poumons, et la radiographie du crane ne montrait pas d'anomalie, quand le tumeur sécondaire dans le cuir chevelu se développa.

RIASSUNTO

L'autore riporta un insolito caso di metastasi al cuoi capelluto da un carcinoma del retto. Nella letteratura si ha solo un altro caso si mile a questo. Benchè le metastasi alle ghiandole e agli organi internisiano frequenti, le metastasi alla pelle non sono comuni e quelle al cuoio sono rare. Nel caso in questione le ghiandole in prossimità del tumore erano indenni; non vi erano metastasi ai polmoni e la radiografia del cranio fatta all'epoca della metastasi non rivelava alcuna anormalità.

> Sunday mornings in America are indeed halcyon seas of luxurious quiescence to anyone wakeful enough to be conscious of their peace. There is no deeper calm to be found in the depths of the ocean, in the heart of the desert. It is a psychic calm, produced by the relaxation of the quivering nerves of the most electric of all peoples.
>
> —*Powys*

Pain of Anorectal Origin

WILFORD L. COOPER, M.D., M.S., F.I.C.S., F.A.P.S., D.A.B.
LEXINGTON, KENTUCKY

IT is highly important to recognize the fact that pain is an indicator of disease. One must investigate the cause rather than merely relieve the pain. In order to make a correct diagnosis, the physician must understand the anatomic, physiologic and psychologic phenomena involved.

The purpose of this paper is to point out the various kinds of pain caused by different types of perianal, anal, rectal and pararectal lesions. An effort will be made to discuss the types and components of the sensation of pain and also to describe the nerve pathways through which pain is transmitted from the anorectal region.

Pain of Anal and Perianal Origin.—In the perianal skin and in the anal canal, pain originates in extremely sensitive tissues that are subjected to stretching and frequent use. Pain originating in the skin of the perianal region is not appreciably affected by defecation, whereas pain in the anus is usually increased thereby. Cutaneous pain in the perianal region may be a rapidly conducted pricking sensation, bright and sharply localized, or it may be the more slowly conducted sensation of burning, which is still fairly well localized.

Sharp or burning pain may result from many conditions, such as abrasions, inflamed condylomas, actinodermatitis, drainage from sinuses, contusions and improper anal hygiene. A frequent cause of perianal and anal irritation is repeated use of the so-called analgesic ointments. Pain, particularly of the burning type, may be observed in persons with perverted sexual habits.[1]

Mild inflammation of the perianal skin with excoriation, which may occur after diarrhea and especially after the ingestion of antibiotics, causes a burning pain, frequently accompanied by itching. This burning or itching sensation may follow the use of antibiotics even in the absence of the diarrhea. Chancroid, gonorrheal infections, the primary and secondary lesions of syphilis and certain diseases of the nervous system (e.g., multiple sclerosis or tumor of the spinal cord) that cause irritation in the lateral tracts of the spinal cord are infrequent causes of "soreness" or "burning" in the perianal region.[1]

Uncomplicated external hemorrhoids do not ordinarily cause pain. Thrombosed external hemorrhoids cause pain in proportion to the magnitude of the thrombosis, the amount of pressure exerted on the overlying skin and the degree of the squeezing effect of the sphincter muscles, which is determined largely by the location of the thrombosis. The pain of a thrombosed hemorrhoid is characterized usually by a sudden onset, followed by continuous stinging or aching pain. It is affected little, if at all, by defecation.

Hidradenitis suppurativa, with multiple small abscesses and infected sebaceous cysts in the perianal skin, causes mild to moderate pain. The pain from an ischioanal or ischiorectal abscess varies with the size of the abscess, the amount of pressure on the overlying skin and the proximity of the abscess to the sphincter muscles. The pain, which is throbbing or aching, is usually constant and may or may not be affected greatly by defecation.

From the Lexington Clinic, Lexington.
Read at the Twentieth Annual Congress of the United States and Canadian Sections, International College of Surgeons, Philadelphia, Sept. 12-15, 1955.
Submitted for publication Sept. 21, 1955.

depending on its proximity to the pectinate line. It must be remembered that a pilonidal cyst abscess may point in the perianal region and ordinary furuncles may occur.

Cryptitis and papillitis may cause burning pain of short duration and after a bowel movement, but cryptitis has been overrated as a cause of pain.

Polypoid lesions, internal hemorrhoids and hypertrophied anal papillae that protrude through the anus only during defecation may cause little or no pain. If they *remain prolapsed*, however, a constant, severe throbbing or aching pain, increased by defecation, may result, accompanied by edema, thrombosis, erosion or gangrene.[1]

Pain caused by an anal fissure or ulceration is characteristically intermittent, cutting or lancinating, starts or increases during defecation and continues from a few minutes to an hour or longer. Abrasions of the perianal skin may cause a sharp cutting pain that is not as severe or as long-lasting as that due to an anal fissure. An intermittent lancinating type of pain that increases during defecation may be caused also by anal ulcerations resulting from regional enteritis, chronic ulcerative colitis, epithelioma or anorectal adenocarcinoma.[1] The diagnosis depends primarily upon a thorough history and a complete physical examination including a sigmoidoscopic study. The "snap diagnosis" of "piles," followed by a quick treatment with suppositories or ointment in the presence of painful lesions of the anorectum may prove dangerous for the patient and embarrassing for the physician.

Pain of Rectal Origin. — The patient's description of pain originating in the rectum may be confusing. The physician should determine first whether the pain is in the skin outside the rectal opening or inside the bowel. Most lesions in and around the rectum do not cause pain unless they involve the anus either directly or by pressure, or produce spasm of the anorectal musculature, or cause ulceration in the rectum with tenesmus. When cancer of the rectum causes pain it may be already too far advanced for successful treatment.

Pain originating in the rectum is usually caused by muscle spasm and is described as a burning, aching or a "pressure type" of pain. It is likely to be poorly localized, seeming to be high in the rectum, low in the abdomen or back, in the pelvis, in the coccygeal region or in the buttocks.

In rare instances, tabes dorsalis and tumors of the spinal cord may cause muscle spasm in and about the rectum.

Proctitis associated with chronic ulcerative colitis, bacillary dysentery, amebiasis or tuberculosis may cause pain through spasms of the anorectal musculature or tenesmus, which was described by Hill,[1] as a painful, ineffectual effort to evacuate the terminal portion of the colon. It may vary from a mild to an intense and constant desire to evacuate the lower portion of the bowel. Likewise, rectal neoplasm (particularly if extensive), impacted feces or foreign bodies in the rectum may cause tenesmus.[1] When the rectal mucosa is sufficiently inflamed in cases of lymphopathia venereum, spasm of the intrinsic musculature of the rectum may occur. Occasionally a painful rectal spasm is associated with diverticulitis.[1] Infrequently, extrarectal malignant lesions that have invaded the rectal wall cause painful spasm of the rectal musculature and tenesmus.[1]

Pain described as a feeling of pressure in the rectum may originate from the excessive use of enemas, from incomplete evacuation or fecal impaction, from the injection treatment of hemorrhoids or from the application of radium to the cervix with subsequent radiation proctitis.

Pain Originating in the Pararectal Tissues.—Pain originating in the pararectal structures may be described as a burning or pressure pain or as an aching discomfort. The patient may state that this pain is "high in the rectum." The examiner must be alert to recognize such causative conditions as an increase in size of the seminal vesicles or prostate gland, presacral tumors, perirectal abscesses, benign and malignant tumors in the perirectal spaces and endometriosis. Inflammatory or malignant processes in the pelvis may cause vague, mild or even severe pain which is poorly localized and may seem to originate in the lower part of the bowel.

The "Thiele syndrome," or coccygodynia, is gaining wide recognition among physicians, especially those who examine many women. Thiele[2] described this condition, which is characterized by tenderness and pain localized in the region of the lower portion of the sacrum and coccyx or in the adjacent muscles and soft tissues in the posterior rectal region. In his opinion, a tonic spasm of the levator ani and coccygeus muscles produces the pain. If the piriformis muscle is involved, pain in the hip and leg also may be produced, owing to pressure on the sciatic nerve. This condition frequently occurs after prolonged sitting or riding in an automobile and is not accentuated by defecation.

A condition not often recognized is proctalgia fugax. Thaysen[3] coined this term to describe a type of spasm of the rectal musculature that is characterized by paroxysms of sudden agonizing pain in the rectal region. The pain may be so intense as to cause severe prostration and may last from one to fifteen minutes. Often the patient says that he has been awakened at night by this pain. The attacks may occur daily or at irregular intervals of weeks or months. Intelligent, sensitive, industrious men, 30 or more years of age, are affected most frequently. The pain is difficult to locate, and opinions differ as to whether the site of the muscle spasm is in the rectosigmoid, the rectum or the internal sphincter. Some observers have expressed the opinion that it is an intussusception of the sigmoid through the rectosigmoid junction into the rectum. The condition is most frequently associated with tension and seems to have a trigger mechanism. In rare instances it may have a physical basis, such as an abnormality of the prostate, the seminal vesicles or other pelvic structures.

Types of Pain.—Pain is a specific sensory experience mediated through nerve structures separate from those which mediate other sensations, such as touch, pressure, heat and cold.[4] There are two distinct types of physical pain: (1) cutaneous, or superficial, and (2) visceral, or deep. Terms that the patient may use to describe the cutaneous type of pain include: "soreness," "burning," "pricking," "lancinating," "cutting" and "sharp." Cutaneous pain can usually be fairly well localized. Deep or visceral pain has a dull, aching quality; it induces depression and inactivity and is generally poorly localized.[5]

The patient's interpretation of pain is dependent on (1) the integrity of the nerve pathways; (2) the degree of the stimulus that causes it; (3) the type of tissue that receives the stimulus, and (4) the patient's threshold for the perception of pain.

Sensation of Pain. — The sensation of pain may be divided into two components: (1) perception of pain and (2) reaction to pain. Perception of pain is a physiologic mechanism and depends upon the intactness of nerve connections and conduction pathways. Reaction to pain, however, as described by Alley,[5] is basically psychogenic, highly individual and modified by complex functions. No true adaptation occurs for pain as it does for touch. Investigation has shown that in healthy persons the threshold for perception of pain is remarkably constant and is approximately the same in all. In contrast, reaction to pain varies between wide limits in different persons and may vary considerably in the same person. The patient's reaction to pain depends upon his individual interpretation. Objective manifestations of pain are affected materially by the degree of mental anguish and discomfort experienced. Reaction to pain is profoundly influenced by environmental and familial backgrounds and by emotional experiences during childhood.[5] Pain of anorectal origin is usually intensified by emotional conflicts.

Nerve Pathways. — In the skin of the anal canal there is a well-developed subepithelial nerve network. The network is composed of fine fibers with small interspaces, as contrasted with that observed in the skin of the thigh, where the interspaces are much larger and the sensation of pain is less.[6]

Reuther[6] has shown by experimental investigation that the subepithelial plexus of nerves of the anal skin is continuous with that of the rectal mucosa. His studies also show that the external sphincter muscle has a double nerve supply, the first and principal supply being from the medullated nerves of the sacral and coccygeal nerve roots and the second from the nonmedullated nerves of the Auerbach plexus of the vegatative system. It is presumed that the nerves that make up most of the subepithelial plexus of the skin and mucosa are sensory and that the fibers of the Auerbach plexus that also supply the external sphincter muscle are motor.

The continuity of the subepithelial and submucosal plexuses of nerves may explain why in some persons there is a continuation of some sensations, such as pain and pressure above the anorectal line, in some instances for as much as 1 cm. This is noted clinically in patients who complain of pain on the introduction of a needle into the rectal mucosa immediately above the anorectal line.[6] Cutaneous pain below the pectinate line and pain arising in the external sphincter muscle is conducted by the pudendal (spinal) nerves.

The rectum and colon receive their afferent innervation through the autonomic system. For most of the descending colon the pain fibers apparently run with the sympathetic system. Ray and Neill[7] observed that distention of the descending portion of the colon after a left thoracoabdominal sympathectomy no longer produced pain. At about the rectosigmoid junction, however, the innervation apparently changes. Ray and Neill[7] noted that sympathectomy, unilateral or bilateral, did not alter pain from balloon distention of the bowel up to 16 cm. above the anus. This indicates that the distribution of the sympathetic system to the pelvis includes few, if any, fibers for pain, with only minor exceptions. Apparently the fibers for pain from the rectum, like those for rectal reflexes, are in the nervi erigentes (pelvic splanchnic nerves, visceral branches of the sacral nerves). In fact, these seem to conduct most pain from the pelvis, whether it is rectal, vesical or attributable to some other origin. It should be pointed out that, whether the pain travels peripherally over the pudendal nerves or the nervi erigentes, it enters the spinal cord over the same nerve roots — approximately the second, third and fourth sacral, since these two sets of nerves usually have the same segmental origins.[8]

SUMMARY AND CONCLUSIONS

Pain of anorectal origin is elucidated by a discussion of the various kinds of pain, caused by different conditions in the perianal, anal, rectal and pararectal tissues.

Unprecedented advances have been made in recent years in the knowledge of the anatomic, physiologic and psychologic phenomena involved in the basic mechanism, clinical manifestations and nature of pain. It has been discovered that the sensation of pain consists of two component parts, namely: (1) perception of pain and (2) reaction to pain. These two component parts can now be accurately differentiated and evaluated. Most investigators divide physical pain into two distinct types: (1) cutaneous, or superficial, and (2) visceral, or deep.

The most important nerve pathways involved in the transmission of pain from the anorectal region are the pudendal nerves and the nervi erigentes.

RÉSUMÉ ET CONCLUSIONS

La douleur d'origine anorectale est éclaircie par une discussion de toute sorte de douleur, causées par des conditions différentes dans les tissus perianaux, anaux, rectaux et pararectaux.

Pendant les dernières années des avances sans pareille ont été faites dans la connaissance des phénomènes anatomiques, physiologiques et psychologiques qui sont compris dans le méchanisme principal, les manifestations cliniques et la nature de la douleur. On a decouvert que la sensation d'une douleur se compose de deux facteurs: 1) la perception de la douleur et 2) la réaction à la douleur. Il est maintenant possible de distinguer et évaluer exactement ces deux facteurs. La plupart des investigateurs distinguent 2 types différents de douleur physicale: 1) douleur cutanée ou superficielle et 2) douleur viscérale ou profonde.

Les conduits les plus importants pour la transmission des douleurs dans la région anorectale sont les nerfs pudendaux et les nerfs érigents.

ZUSAMMENFASSUNG UND SCHLUSSFOLGERUNGEN

Schmerzen im After und im Mastdarm werden erörtert, und die verschiedenen Arten des Schmerzes, hervorgerufen durch verschiedene Erkrankungen in der perianalen Gegend, im After, im Mastdarm und im pararektalen Gebiet werden besprochen.

Unsere Kenntnisse von anatomischen, physiologischen und psychologischen Bedingungen, die im grundlegenden Mechanismus der klinischen Erscheinungen und hinsichtlich der Art des Schmerzes eine Rolle spielen, haben sich in den letzten Jahren wie niemals zuvor erweitert. Man hat entdeckt, dass die Sensation des Schmerzes sich aus zwei Faktoren zusammensetzt, nämlich 1) der Wahrnehmung des Schmerzes und 2) der Reaktion auf den Schmerz. Diese beiden zusammengehörigen Funktionen können heute genau unterschieden und bewertet werden. Die meisten Forscher teilen den physischen Schmerz in zwei unterschiedliche Typen ein: 1) den oberflächlichen oder Hautschmerz und 2) den tiefen oder viszeralen Schmerz.

Die wichtigsten Nervenbahnen, die bei der Fortleitung des Schmerzes von der After-und Mastdarmgegend eine Rolle spielen, verlaufen in den Schamnerven und den Nervi erigentes.

RIASSUNTO

Viene discusso il dolore di origine anorettale nei suoi diversi tipi e con le sue varie cause di origine perineale, anale, rettale e pararettale. E' assai progredita in questi ultimi anni la conoscenza delle condizioni anatomiche, fisiologiche e psicologiche che formano la base di questo dolore. Siè scoperto che la sensazione dolorosa consta di due elementi diversi: la percezione del dolore e la reazione al dolore. Queste due componenti possono essere differenziate e valutate separatamente. La maggior parte dei ricercatori distingue due tipi di dolore fisico: il cutaneo o superficiale e quello viscerale o profondo. Le principali vie nervose lungo le quali si trasmette il dolore dalla regione anorettale sono i nervi pudendi e gli erettori.

REFERENCES

1. Hill, J. R.: Pain in the Anorectal Region, J.A.M.A. 150:579-582 (Oct. 11) 1952.

2. Thiele, G. H.: Coccygodynia: Mechanism of Its Production and Its Relationship to Anorectal Disease, Am. J. Surg. 79:110-116 (Jan.) 1950.

3. Thaysen, T. E. H.: Proctalgia Fugax: A Little Known Form of Pain in the Rectum, Lancet 2: 243-246 (Aug. 3) 1935.

4. Wolff, H. G., and Wolff, Stewart: Pain: A Monograph. Springfield, Ill.: Charles C Thomas, Publisher, 1st ed., p. 3.

5. Alley, R. C.: Surgical Pain: Its Importance and Clinical Management, J. Kentucky State M. A. 50:105-108 (March) 1952.

6. Reuther, T. F.: Nerves of the Anorectal Region. Tr. Am. Proct. Soc. 203-207, 1940.

7. Ray, B. S., and Neill, C. L.: Abdominal Visceral Sensation in Man, Ann. Surg. 126:709-723, 1947.

8. Hollinshead, W. H.: Personal communication.

How shall we deal with fear? One of the most effective methods is that of thought, the method of facing reflectively what we are afraid of and thereby putting it in perspective. Many fears are rooted in childish egotism. A palpitation in the chest, a speech that fails to come off, the absence of a hoped-for letter may loom so large as to cut off the sun. This is a failure in one's sense of humor, which is in essence a sense of propriety and proportion. Bertrand Russell says that he used to be in terror at having to give a speech, but that a very simple device went far to remove his fear. He asked himself what difference it would make a hundred years hence even if the speech were a complete failure, and at the obvious answer, "None," he found his lightness of heart returning. Emerson speaks of attending a meeting where tempers were ruffled and hot words flew, and then going out and looking up at the quiet stars. They seemed to look at him reprovingly as if to say, "Why so hot, little man?" Wordsworth, the most serene of poets, reminds us that our noisy years are only moments in the eternal silence. It takes us long to learn that lesson.

—*Blanchard*

Editorial

The Position of the Specialist in the International College of Surgeons

ONE of the oddest and most interesting phenomena of human life is the completeness with which an apparently fixed idea, sometimes of many years' standing, can be reversed. One such sweeping alteration of opinion, in which the International College of Surgeons can lay proud claim to a pioneer's distinction, is the spectacular growth in stature and consequence of the surgical specialists among us—the almost universal recognition of the fact that the truly skilled specialist in any surgical field stands on equal ground with the best general surgeon.

It was not always so, by any means. Specialization, like any other project based on a new idea, has had to batter down the walls of prejudice invariably built up by those who defend the *status quo* merely because it is the *status quo;* no disturbance thereof can be allowed, lest credit or prestige be snatched from the builders.

So characteristic of human nature is the tendency toward inertia on the ground of "letting well enough alone" that this is hardly surprising. What is surprising is the fact that the general surgeons, having won their own battle, forgot it. Surgery of any kind was suspect for years, and that suspicion was not dispelled without a struggle.

But did general surgeons remember, after the event, with what heartbreaking difficulty the victory was won? Not at all. When certain of their formerly docile colleagues, disciples and even pupils came forward with the suggestion that a surgeon who should concentrate all his study and all his practice on one organ or group of organs of the human body might make unexpected contributions to surgical knowledge, the general surgeons, almost to a man, began to "accentuate the negative" with all the fury of the accepted pundit who feels life's foundations tottering beneath him. In the earlier battle, the negative emphasis had come principally from forces outside the profession — the lay public and the civil and secular authorities. This time the overwhelming weight of the attack was launched by the very men who, by their own dedication to science in their hot youth, had established surgery as invaluable and unassailable. The threats formerly in vogue no longer served, so they chose the best available weapon, ridicule. What? Spend the whole of one's life and work on one organ, one gland, or ganglion or, perhaps (with heavy sarcasm) one toe of the left foot? Ridiculous. Preposterous. Idiotic. Why, it would make a man the laughingstock of the world. Moreover, he would get no patients for his pains, because the veriest imbecile in the population would know better than to trust a doctor who had such limited knowledge to offer!

The fact that all specialists must first pass the general course of instruction was brushed aside as irrelevant. How much would a man remember of what he had learned, if he never had occasion to use it again? No, something must be done to nip this wild idea in the bud. Talk would not do it; that was already apparent.

Accordingly, they acted—and vigorously. It is embarrassing now to remember how long, and with what pertinacity, the specialist was regarded within his own profession as a sort of half-surgeon, in no way equal to his brother practicing general surgery, who knew all there was to know about the whole body and how best to treat it, not in one area but in *many. Specialists were flatly denied* admission to surgical societies, with the plain implication that they were not surgeons at all. In Europe, in our own country and elsewhere—in fact, all over the world—attempts were made to subordinate the ophthalmologist, the otolaryngologist, the gynecologist, the neurosurgeon and even the orthopedist, as well as many other specialists, to an inferior status.

But truth, like murder, will out. We of the International College of Surgeons, in retrospect, are well pleased with the role truth and conscience led us to play in this controversy. At the time our College was founded the specialists were still disregarded. Nevertheless they were beginning to prove their point: namely, that there is more to be known about the human body in health and disease than it is possible for any one man, in a single lifetime, to learn.

We were convinced. The evidence was plain. We knew they were proving their point and would prove it again and again as the years rolled on. Could anyone believe, for example, that the extremely delicate fenestration procedure, which has restored hearing and happiness to thousands, would ever have been devised by a general surgeon? It was the result, and could only have been the result, of one man's patient, tireless, determined and undivided study of the human ear. Could a general surgeon have found time, among his multitudinous duties, to work out the almost miraculous technics now employed in surgical treatment of the eye? of the brain and nervous system? of the problematic but cosmically important female organs? of the malformed or shattered skeleton? of the ghastly wounds and mutilations of war? Could a general surgeon, in the midst of his practice, have discovered radium and its corollary, radioactivity? Yet these discoveries have revolutionized diagnosis and are constantly opening new doors to therapeutic wonders.

So we welcomed the specialists into the College as our companions and peers. We were not ashamed to admit that no man is omniscient. We knew that not only we but their worst detractors were already using technics based on the specialists' methods or adapted from them. We did not hesitate to acknowledge this debt. Moreover, we believed then — and time has proved that we were not mistaken —that the best possible deterrent of specialization's only real hazard, overspecialization, is the constant association of specialists and general surgeons, all working together in a challenging cause. And so it has proved. The exchange of ideas acts as a check on both—on any tendency of the general surgeon to cling to the whole of the past and equally on any tendency of the specialist to forget or ignore the parts of it that made their own work possible.

Nowadays, we observe with some amusement, the "welcome mat" is out to the specialist. Many other surgical groups are following our example. We have no quarrel with the time-tested adage "Better late than never"; we agree with it. Still, there is satisfaction in having avoided the discomfiture of waiting for truth to be popular before acting upon it.

As is now well known, the specialists within the College have organized their own interna[illegible] with the parent organization and present their own specialized programs at our Congresses. They have won wide recognition and warm appreciation by their successful handling of these programs, thereby not only demonstrating the importance of their own work but extending, in ever-widening circles, the influence of the College on contemporary thought. The International College of Surgeons, itself a microcosm of democracy and world friendship, will owe no small part of its contribution to the eventual macrocosm to these obstinate protagonists of the bigness of little things. Let it not be thought that the gains are asymmetric. The specialists in the College have proved themselves among the most valuable exponents we have. They are not unmindful of the faith we had in them when they needed it most, and they return that faith in full measure through their dedicated service to the ideals upon which their College is founded.

As a tribute to our specialist Fellows for the good and fruitful work they have done and are doing we have so reorganized the presentation of our Journal material as to give each specialty its due. We hope that it pleases them all. If so, we are well rewarded in advance; for, as is not uncommon with plans undertaken in gratitude, it pleases us too. We think it has immensely improved the Journal.

M. T.

* * *

The chequered history of religion and morality is the main reason for the widespread desire to put them aside in favor of the more stable generalities of science. Unfortunately for this smug endeavor to view the universe as the incarnation of the commonplace, the impact of aesthetic, religion and moral notions is inescapable. They are the disrupting and the energizing forces of civilization. They force mankind upwards and downwards. When their vigor abates, a slow mild decay ensues. Then new ideals arise, bringing in their train a rise in the energy of social behavior. The concentration of attention upon matter-of-fact is the supremacy of the desert. Any approach to such triumph bestows on learning "a fugitive, and cloistered virtue," which shuns emphasis on essential connections such as disclose the universe in its impact upon individual experience.

—*Whitehead*

New Books

Books Received.—The following books have been received by the Editor; they will be reviewed critically as space and facilities permit. Omission of more extended review, however, is not to be taken as criticism of the merit of the book.

Man in a Cold Environment: Physiological and Pathological Effects of Exposure to Low Temperatures. (Monograph No. 2 of Physiological Society series.) By Alan C. Barton and Otto G. Edholm. London: Edward Arnold, 1955; Baltimore: The Williams and Wilkins Company, 1955. Pp. 273.

Antimicrobial Therapy in Medical Practice. By Harrison F. Flippin and George M. Eisenberg. Philadelphia: F. A. Davis Co., 1956. Pp. 284.

Nursing Practice and the Law. By Milton J. Lesnick and Bernice E. Anderson. Philadelphia: The J. B. Lippincott Company, 1955.

Joint Ligament Relaxation Treated by Fibro-Osseous Proliferation. By George Stuart Hackett. Springfield, Ill.: Charles C Thomas, Publisher, 1955. Pp. 97, with 17 illustrations.

The Blood-Brain Barrier, with Especial Regard to the Use of Radioactive Isotopes. By Louis Bakey. Springfield, Ill.: Charles C Thomas, Publisher, 1956. Pp. 154, with 32 illustrations.

Current Therapy, 1956. Edited by Howard F. Conn. Philadelphia: The W. B. Saunders Company, 1956. Pp. 632.

Ophthalmology. Edited by Paul C. Craig. Fort Pierce Beach, Florida: The Froben Press, 1955. Published as a memorial to the late Dr. Otis R. Wolfe.

Peripheral Nerve Injuries. Edited by H. J. Seddon. Medical Research Council Special Report, Series No. 282. London: Her Majesty's Stationery Office, 1954. Pp. 451, with 276 illustrations.

The Doctor's Legacy. Edited by Laurence Farmer. New York: Harper & Brothers, Publishers, 1955. Pp. 267.

Cardiovascular Surgery. Henry Ford Hospital International Symposium. Edited by Conrad R. Lam. Philadelphia and London: The W. B. Saunders Company, 1955. Pp. 542.

Pathology. By Peter E. Herbut. Philadelphia: Lea & Febiger, 1955. Pp. 1227, with 1,378 illustrations in 661 plates, including 6 in color.

Cancer Cells. By E. V. Cowdrey. Philadelphia and London: The W. B. Saunders Company, 1955. Pp. 667. Illustrated. *Reviewed in this issue.*

Sachs Essays. By Ernest Sachs. Hamden, Connecticut: The Shoe String Press, 1955. Pp. 118, with frontispiece (portrait of author).

Color Atlas of Pathology. U. S. Naval Medical School, Bethesda, Md. Pp. 450, with 1032 illustrations.

Atlas of Plaster Cast Techniques. By E. E. Bleck. Chicago: The Year Book Publishers, 1955. Pp. 128, with 437 illustrations. *Reviewed in this issue.*

Peripheral Vascular Disease. By A. J. Barnett and J. R. Fraser. Melbourne, Australia: Melbourne University Press, 1955. Pp. 200. Illustrated. *Reviewed in this issue.*

Applied Medical Bibliography for Students. By William Dosite Postell. American Lecture Series No. 259. Springfield, Ill.: Charles C Thomas, Publisher, 1955. Pp. 142.

Arthroplasty. By St. J. D. Buxton. Philadelphia: The J. B. [illegible]ny, 1955. *Reviewed in this* [illegible]

BOOKS REVIEWED

Thromboembolic Disease. By G. De Takats. Springfield. Ill.: Charles C Thomas, Publisher, 1955.

This is a pocket-sized monograph of some 50 pages. It outlines the various clinical forms of thromboembolic disease and discusses the factors that cause clotting within various parts of the vascular tree.

The author discusses both prophylactic and active treatment for the various conditions described and attempts to evaluate them in terms of his experience.

A liberal bibliography is appended.

This condensed outline of the problems presented by thromboembolic disease should prove useful to medical students and general practitioners.

RAYMOND W. MCNEALY, M.D.

Henry Ford Hospital International Symposium on Cardiovascular Surgery. Edited by Conrad R. Lam. Philadelphia and London: The W. B. Saunders Company, 1955. Pp. 542. Illustrated.

The book is made up of talks given by internationally known authorities on the physiologic picture, diagnosis and treatment of heart disease. Its emphasis is definitely surgical. The articles are beautifully presented and well illustrated. and are followed by discussions. This book is the latest, as well as the most comprehensive in its field, that I have encountered. It is as outstanding as was the symposium itself. It presents in great detail the specific problems with which the experts have been confronted and their opinions as to the best available solutions.

Diagnostic technics include cardiac catheterization and electrocardiographic, angiocardiographic and electrokymographic studies, with some of their newer implications. Adjustments between the systemic and the pulmonary circulation are discussed. Pulmonary stenosis, transposition operations and operations for septal defects are discussed, including reports of successful use of the heart-lung machine.

In the section on acquired heart disease, in addition to a discussion of the mitral valve, there is an extensive section on operations for aortic stenosis and aortic insufficiency. Last but not least, there is a large section devoted to the technics of aortal and arterial grafting.

All in all, the book is a necessity to the cardiovascular surgeon.

HERBERT D. TRACE, M.D.

Physiology and Anatomy. By Esther M. Greisheimer. Philadelphia: The J. B. Lippincott Company, 1955. 7th ed. Pp. 868, with 430 illustrations, 48 in color.

This well known and widely used textbook has been completely revised, rewritten and reset. The material on the endocrine and nervous systems has been enlarged and brought up to date, on the basis of the modern concept of pituitary control. The book is cleverly divided into five units.

Unit 1 concerns the body as an integrated whole. This unit is then divided under two subheadings, giving a complete introduction to anatomy and a complete introduction to physiology.

Unit 2 is concerned with the erect and moving body. This consists of chapters discussing the skeletal system and the anatomic and physiologic aspects of the muscular system.

Unit 3 is concerned with the integration and control of the body by the nervous system. This is subdivided into three chapters on the anatomic and physiologic aspects of the peripheral nervous system, the central nervous system and the special senses.

Unit 4 is concerned with the metabolism of the body and its maintenance. This is concerned with blood and tissue fluids, the anatomic and physiologic aspects of the circulatory system, the respiratory systems, the digestive system and the excretory system. The regulation of body temperature and the anatomic and physiologic aspects of the endocrine systems are the completion of unit 4.

Unit 5 comprises the anatomic and physiologic aspects of the reproductive system. The unusual factors in this book that make it so well known and widely read are the glossary and the prologue, which, to my way of thinking, is an excellent application of the anatomic facts concerned during the functional performance of the body as a whole. These are intelligently and completely brought out.

This book is an excellent textbook, primarily for the teaching of nurses. I recommend it to doctors in general for the excellent review of the systems in the light of contemporary teaching. The completeness of the anatomic parts is not necessary, since this information could be obtained from any textbook in anatomy. The physiologic and anatomic physiologic portions, however, are of primary concern to the busy doctor who would like to "brush up" on some phase of physiology that he remembers only slightly. The section on electrolytes and salt and mineral balance is excellent. The book is widely recommended to interns, residents, nurses and doctors in general.

JEROME J. MOSES, M.D.

Atlas of Plaster Techniques. By E. E. Bleck, Nellie Duckworth and Nancy Hunter. Chicago: The Year Book Publishers, 1955. Pp. 128, with 437 illustrations.

This small book is well printed and easy to read. It is almost a picture book on the use of plaster casts, showing pictorially the uses of plaster of paris, the method of application, the use of various types of padding and the methods of removal of the plaster.

This book should be in the hands of every medical student. General practitioners who treat fractures will also find the book extremely useful.

H. E. TURNER, M.D.

Cancer Cells. By E. V. Cowdrey. Philadelphia and London: The W. B. Saunders Company, 1955. Pp. 677. Illustrated.

It is indeed a pleasure to review a book by Dr. Cowdrey. It would be difficult to find an author who can handle a difficult subject as clearly, concisely and eloquently as Dr. Cowdrey has done in this publication.

The book is logically divided into numerous chapters, beginning with a definition of cancer. Malignant growth of cancer cells, the nuclei and division of normal and malignant cells and the chemical properties of cancer cells are discussed. Further chapters deal with cancer in animals and plants and with carcinogenic agents. Other chapters are devoted to the possible causes of cancer (trauma, viruses, mutation, heredity, susceptibility, etc.).

The final chapters deal with the geographic frequency of different types of cancer and with diagnosis, prevention and treatment. Unexplained disappearance of the lesion and change in the malignancy of cancer cells and cancer research are also discussed. An appendix supplies the nomenclature of tumors, a list of cancer registries and a directory of publications and symposiums on cancer.

Each chapter is a unit in itself, and at the end of each Dr. Cowdrey summarizes the subject. This book truly should be read by every member of the medical profession and allied sciences. It will give the inexperienced a beautiful review of present knowledge of the cancer problem.

The experienced research worker will find in each chapter a wealth of data, knowledge and experience. This reviewer can honestly state that the book has given him hours of great pleasure. It is one of the masterpieces of present medical literature and belongs in every medical library.

WERNER F. EISENSTAEDT, M.D.

Peripheral Vascular Disease. By A. J. Barnett and J. R. E. Fraser. Melbourne: Melbourne University Press, 1955. Illustrated

This is a monograph of about 200 pages, including an extensive bibliography and an index. There are many illustrations in black and white and a few in color.

A short review of the history of knowledge of peripheral vascular disease occupies the first few pages. This is followed by an interesting review of the physiologic aspects of blood vessels.

. Chapter 3 is devoted to methods of diagnosis of arterial insufficiency and is well illustrated with photographs, graphs and charts.

Chapter 4 covers the pathologic background of vascular disease, with a classification of the various conditions.

The remainder of the monograph is devoted to the clinical features of peripheral vascular disease and their treatment.

The authors have made a thorough review of the literature and have classified the articles according to their relation to the various chapters. A number of case histories are presented to illustrate the various clinical syndromes.

This book is a valuable addition to the bulging shelves of those devoted to studying various phases of peripheral vascular disease. Its worth to each reader will depend on his familiarity with the voluminous literature on this subject. The material is clearly presented and well organized.

RAYMOND W

Applied Medical Bibliography. By William Dosite Postell. Springfield, Ill.: Charles C Thomas, Publisher, 1955. Pp. 142. Illustrated.

An excellent handbook for medical writers, editors and librarians will be found in this compact volume, in addition to a fascinating historical introduction to the science of preserving the scientific knowledge of the past. Beginning with the Assyrians, the Egyptians and the Greeks, the author explains how the need of records arose and the factors that led to bibliographic technic as it is known today. He traces the history of medical writing from manuscript to book to medical journal in a pleasant, readable manner and thus sets the scene for the practical chapters that follow. These deal successively with the organization of the medical library, the indexing of book collections, the basic reference books available, and the indexing of collections of periodicals dealing with medicine and surgery, both general and specialized. He then takes up the practical methods of work used in scientific investigation, studies of the literature, etc., of preparing the reference paper, and of compiling the working bibliographic list, and of securing and presenting documentation.

The illustrations, which consist principally of sample library and file cards and tear sheets reproduced from bibliographic lists, are well and aptly chosen for the purpose they serve. There is a good index, as well as a list of questions by which the student may test himself on finishing his study of the book.

Since there can scarcely be too much order and system when it comes to scientific records, we wish this admirable little manual a wide circulation.

MAX THOREK, M.D.

Complications of Regional Anesthesia. By Daniel C. Moore. Springfield, Ill.: Charles C Thomas, Publisher, 1956. Pp. 291.

This truly classic book is a product of love for a subject, curiosity and searching combined with a true desire and ability to teach. Dr. Moore has presented, in approximately 300 pages, a complete account of the complications of regional anesthesia. He discusses in detail the signs, symptoms, diagnosis and treatment. In addition to an excellent discussion, orderly, clearly illustrated and well organized, there is an excellent bibliography, and the illustrations aid immensely in the understanding of the text.

The book is essentially written in three major parts. The first part deals with the complications of local infiltration and peripheral nerve block. Not only the pharmacologic complications but the physical complications are adequately discussed. The second part discusses, in excellent detail, the complications of spinal and epidural blocks. The third section discusses the incidental complications that are so frequently omitted but which are so important to the clinician.

In essence, this book can strongly be recommended to all members of the medical profession who deal with any form of regional anesthesia. It has the clarity necessary for the general practitioner as well as the details for a resident in anesthesia. It has the clinical acumen of Dr. Moore so wound into its text that it takes on value for the surgeon or the individual occasionally using regional anesthesia.

MAX S. SADOVE, M.D.

Ophthalmology. Edited by Paul C. Craig. New York: The Froben Press, 1955. Pp. 122. Illustrated.

This short book, consisting of articles that have appeared in the Section on Ophthalmology and Otolaryngology of *The Journal of the International College of Surgeons*, was published as a memorial to Dr. Otis R. Wolfe of Marshalltown, Iowa, and as a tribute to his work in the treatment of cataract, especially in children. It contains, in addition to two of Dr. Wolfe's own original articles, twelve others by prominent contributors to the Journal. A short introductory statement by the editor, Dr. Craig, and a personal tribute to Dr. Wolfe by Dr. Oscar J. Nugent are featured.

Abstracts from Current Literature

Postoperative Infection of Intervertebral Disc Space. Ford, L. T., and Key, J. A., Southern M. J. 48:1295, 1955.

When frank and overwhelming wound infection occurs after disc operations, the diagnosis soon becomes obvious to all concerned. An unusual type of infection, concealed in and confined to the intervertebral disc space, can occur after operation upon the disc.

It is possible, after operation for a lowgrade infection to develop in, and remain localized to the intervertebral disc space. Development of such a complication must be kept in mind as a possibility when a patient develops sciatic pain and pain in the back, with or without a febrile course, after a disc operation. The presence of a cleanly healed incisional wound does not rule out the possibility of infection of the disc space. The infection may either be dormant for a while or be masked sufficiently to be undetected for weeks or months. In the authors' opinion, antibiotics are responsible to a large degree for this masking, and without them these infections might have been fulminating operative wound infections. Once the presence of such an infection is evident or strongly suspected, they consider a second operation indicated for evacuation and drainage of the intervertebral disc space. The second operation may be undertaken in an effort to relieve persistent pain and disability, and infection may not be suspected.

If evidence of infection is found in the disc, the posterior portion of the annulus should be opened wide. Particular care should be taken not to tear or incise the dura. The disc space should then be curetted, gently but thoroughly, and the wound irrigated with a warm sulfonamide solution. Penicillin powder should be placed in the disc space and a small petrolatum gauze or rubber tissue drain left in the infected area and led out through the wound. The wound should then be closed in layers and general antibiotic and supportive therapy continued. In none of the authors' cases was the operation for drainage performed, nor was the infection suspected until weeks or months after the primary procedure. If they suspect the presence of a wound infection during the period of primary healing they open and drain the wound immediately, evacuating any hematoma that may be present, and start intensive antibiotic therapy. Four cases are presented.

William E. North, M.D.

Carcinoma of the Lung. Squire, F. H., J. Iowa State M. S. 45:409, 1955.

It is easy to make the diagnosis of carcinoma of the lung after the patients have begun exhibiting symptoms, but one must bear in mind that, of the patients who present symptoms and come to operation, between 90 and 98 per cent will die within five years. Of the patients with inoperable lesions who are treated palliatively, 99 per cent will be dead within two years. In the asymptomatic group, 90 per cent of the lesions will be resectable. In 75 per cent, no metastasis to the lymph nodes will be demonstrated. The overall survival rate is not yet definitely known. The greatest error of the past has been watching tumors month after month in order to study their growth, rather than diagnosing them and operating promptly. At Presbyterian Hospital in Chicago, during the past two and one-half years, the author has seen more than 50 patients in whose cases the diagnosis of primary carcinoma of the lung had been made. Twenty of them had resectable tumors; the majority of them were between the ages of 50 and 80, but a few were between 30 and 40. The asymptomatic lesions picked up on routine thoracic roentgenograms usually show small nodules in the lung parenchyma, localized areas of emphysema or slightly clouded zones of atelectasis. Many special roentgen procedures can be used to investigate these lesions further; of these, anteroposterior and lateral roentgenograms taken on inspiration and expiration will show the nodules and the areas of atelectasis and emphysema. Fluoroscopic study will help with the localization and rule out pulsations of vascular masses. Bronchograms have been used extensively to show obstructions to the bronchus. In the author's hands laminagrams [illegible] helpful, because they rule [illegible] of tuberculosis, show the [illegible] chus and often [illegible] s not visualized by other means. In rare ances they have made angiocardiograms to rentiate tumor from enlargement of the t or great vessels. Several roentgenograms reproduced and presented to demonstrate acteristic lesions.

WARREN A. YEMM, M.D.

a place du curage Parasternal dans le tement du cancer du sein (The Status of asternal Gland Dissection in the Treat- t of Carcinoma of the Breast). Redon, H., Lacour, J., Presse Méd. 63:1173, 1955.

he therapeutic problem of mammary can- is the subject of many controversies. Faced the inadequacies of Halsted's original ation, surgeons, physicians and radiother- ts have not ceased proposing new theories trying new methods of treatment. The iors outline the evolution of these ideas arrive at the actual problem of extended tectomy.

lthough in 1918 Stibbe had already advised oval of the parasternal lymphatic chain, ras not until 1951 that Soerensen intro- ed this extended gland dissection in the tment of carcinoma of the breast. Ana- ically it seems desirable, but from the it of view of prognosis it is far from solv- the problem.

he authors have studied in detail their 100 s of mastectomy extended by parasternal id dissection and by comparing their re- s with those of other authors and those ined by "simple" Halsted operations and e tried to arrive at practical conclusions.

f the 800 operative cases recorded in the ld literature, the average rate of paraster- gland involvement seems to be about 27 cent, varying, according to the site of the ior, from 17 to 39 per cent.

n the authors' series of 100 cases, 60 tu- s were situated centrally or in the internal drants and 40 in the external quadrants. hty patients underwent double dissection he axillary and internal mammary glands, le 20 underwent triple dissection, removal he supraclavicular glands being added.

he distribution of the parasternal glands he different intercostal spaces was studied m the anatomic standpoint. In 38 cases re were glands in the first intercostal space which 10 were invaded); in 46 cases, nds in the second space, with 17 invaded; 29 cases, glands were present in the third space, with 9 invaded, and in 17 cases glands were present in the fourth space, with 4 invaded. Therefore, contrary to the general opinion held heretofore, glands in the fourth intercostal space are not rare. The first and second spaces contain the greatest number of glands and the highest ratio of secondary involvement.

From the point of view of distribution of metastatic glands in relation to the site of the tumor, there was axillary gland involvement alone in 28 cases of tumor of the median and 17 cases of tumor of the lateral quadrant (total 45). Internal involvement of the mammary gland alone was noted only in 2 cases of carcinoma of the median quadrant. The axillary and internal mammary glands were invaded together in 14 cases of median and 6 cases of external quadrant tumors (total 20). Absence of glandular involvement was met with in 45 cases. Therefore the 55 per cent rate of gland involvement corresponds with the figures given by other authors.

It is important to note that not a single case of *isolated* supraclavicular adenopathy was encountered and that there were only 2 cases of pure parasternal internal involvement of the mammary gland.

All the patients have been followed up for six months to over two years. Although it is admitted that the five-year period is still far ahead, some conclusions can already be drawn: From the point of view of the tumor site, there were 14 failures in 60 cases of internal quadrant or central tumors (24 per cent) and in 5 of external quadrant tumors (12.5 per cent). Of 84 patients followed up for more than one year 13 are dead or presenting metastases (15 per cent), and of the 55 patients followed up for more than two years, 14 are dead or presenting recurrences (25 per cent).

To emphasize the seriousness of extended mastectomy, these 100 operations are compared with 100 "simple" Halsted mastectomies. There were no operative deaths with the extended technic, but the results do not show any marked change in the two-year survival rate (27 and 25 per cent respectively). On the other hand, the incidence of metastasis in the first year is much higher after extended mastectomy. One wonders whether surgical trauma could play a rôle here.

From these meticulous studies the authors try to draw conclusions. The notion of "evolutive cancer" is introduced. By this term they mean a recently detected carcinoma with glandular involvement and signs of actual evolution, almost acute, sometimes with inflammatory-looking swelling and peritumoral edema. From here one might consider another aspect of malignant conditions, i.e., "cancer disease" as opposed to a more local cancerous process. Such considerations might dictate the time to operate, and certain surgeons will not even *contemplate operation in cases of "cancer* disease."

The authors admit that under such conditions, and since their statistics bear only on a limited number of cases followed for less than the five-year period, it is difficult to draw conclusions with regard to the therapeutic value of extended mastectomy, which limits its interest. For the moment they can only say that results seem not to be worse than those of other methods of treatment. The problem is worth studying, and in the meantime this is the method they have adopted at the Gustave-Roussy Cancer Institute in Paris: In stages I and II, a preoperative extemporaneous biopsy is performed. If the result is positive they perform a Halsted operation, with removal of axillary glands. If these glands show involvement on immediate histologic examination the operation is extended by removal of the parasternal glands. The authors remain ready to change their attitude as more facts are accumulated.

This is a very frank and serious study, full of important details and enriched with a complete bibliography. Those who are interested in the subject will impatiently wait for the details promised in future communications.

S. A. GUEUKDJIAN, M.D.

De la Paralysie Faciale: Modifications des opérations d'anastomose Facio-Hypoglosse et de Plastie Faciale (Facial Paralysis: Modifications to the Operations of Facio-Hypoglossal Anastomosis and Facial Plasty). Lodge, W. O., and Gueukdjian, S. A., Presse Méd. 63:1025, 1955.

Facial paralysis of the peripheral type is often amenable to surgical treatment. Operation is advocated when signs of recovery do not appear within six weeks of the onset.

In cases of recent origin, when the lesion is situated above the geniculate ganglion, faciohypoglossal anastomosis is advised. The authors' personal modification to this operation is described: A free segment of the external jugular vein measuring about 1 to 1.5 cm. is prepared; this is slid over the sectioned hypoglossal nerve; the anastomosis with the facial nerve is then established, and the strip of vein is slid upward and held in place as a "cuff" at the site of the anastomosis. It is thus thought that regeneration of the axial nerve and anastomotic stability are more readily insured.

The *second operation is employed in cases* of long-standing paralysis in which neural anastomosis would be of no avail. A strip of fascia lata is utilized. Passed through three tiny incisions that leave no scar, the fascial band surrounds, in a triangular tract, the atrophied muscles corresponding to the orbicularis, the levator superior and the great zygomaticus. The indications for this free fascial graft are long-standing facial paralysis with esthetic disfigurement, ectropion and corneal ulceration.

Illustrations explain the technic of both procedures.

In spite of surgical advances, facial paralysis remains a difficult problem, and partial restoration is all that can be achieved by any *surgical procedure. In all cases, physiotherapy* plays a significant rôle.

S. A. GUEUKDJIAN, M.D.

Citric Acid Intoxication. Bunker, Stetson, Coe, Grillé, and Murphy, J.A.M.A. 157:1361, 1955.

It is possible to predict with assurance that citric acid intoxication is likely to occur, during multiple transfusions of citrated blood, in patients with disease of the liver or with mechanical obstruction to hepatic circulation, and also in any patient, with or without disease of the liver during extremely rapid and prolonged infusions of citrated blood or plasma.

Thirty-three normal adult patients who had undergone major operations and received multiple transfusions at a rate of not more than about 500 cc. every thirty minutes gave no evidence of citric acid intoxication. Thus, if the rate at which citrate was infused remained below 0.5 mg. per kilogram of body weight per minute, the serum concentration of citrate ion remained below 9 mg. per hundred cubic centimeters (0.5 mM. per liter) and the calculated ionized calcium level remained above 0.85 mM. per liter, which is within the normal range.

The treatment of citric acid intoxication with intravenously administered calcium salts has not been satisfactory. It has been difficult to predict accurately how high the citrate level has risen or how great a rise in the serum calcium level will occur after a given intravenous dose of calcium chloride. There is, consequently, a real danger of calcium overdosage. Possibly a better solution is to avoid citrated blood altogether in those cases in which citrate intoxication might be feared. Other chelating agents have recently been made available for the preservation of blood, such as ethylene diamine-tetra-acetic acid disodium, but, until more is known about the destruction and elimination of these agents by the body, they must be considered potentially dangerous as binders of calcium. Decalcified blood, collected by passage across a cation exchange resin, is a nearly ideal preparation for multiple rapid transfusions. In passage across the exchange resin, serum calcium (as well as potassium and magnesium) is replaced with sodium ion, and clotting is thus prevented. During multiple transfusions of blood collected in this manner, the calcium ion lacking in the transfusions can be accurately replaced. Packed red blood cells or resuspended red blood cells can also be used to advantage when citric acid intoxication is feared.

WILLIAM E. NORTH, M.D.

The Results of Direct Vision Closure of Ventricular Septal Defects in Eight Patients by Means of Controlled Cross Circulation. Lillehel, C. W.; Cohen, M.; Warden, H.; Ziegler, N. R., and Varce, R. L., Surg., Gynec. & Obst. 101:447, 1955.

Eight seriously ill patients were submitted to the suture closure of ventricular septal defects under direct vision. Two infants died respectively four and eleven days after the operation, from respiratory complications.

Four of the 6 survivors were demonstrated, by recatheterization four to nine months later, to have maintained complete correction of the surgical closure.

In these 8 patients the heart and lungs were totally by-passed for five to twenty and one-half minutes by controlled cross circulation preparations. The technic of the method consists of the simultaneous reciprocal exchange of equal quantities of compatible blood from the arterial system of the donor to the patient's arterial circulation and from the caval system of the patient to the veins of the donor. A pump is essential for accurate control of the interchange, which takes place at a much reduced rate of blood flow for the duration of the total by-pass period.

All operations were carried out with the patients at normal body temperature to obviate the harmful effects of subnormal temperature upon the cardiac conduction system.

Disturbances of the conduction system did not occur, even though no effort was made to avoid the so-called vulnerable areas when sutures were placed in the ventricular septum. The authors interpret this as an indication that the totally by-passed heart at normal temperature requires only a much reduced coronary arterial flow to remain well oxygenated. Furthermore, such a heart becomes strongly resistant to arrhythmia.

Cross-circulation total cardiac by-pass has so far been unaccompanied by mortality or serious complications. There has been no donor mortality, nor have any significant donor complications been observed.

THOMAS WILENSKY, M.D.

The Palliation of Bronchial Carcinoma by Radiotherapy. Blanshard, G., Lancet 2:897, 1955.

This report covers six months of 1953 and is based on 35 cases of histologically confirmed bronchial carcinoma. Fifteen of the tumors were squamous cell carcinomas, 11 were oat cell carcinomas and 9 were carcinomas of other types. The authors have made careful assessment of dyspnea, cough, thoracic pain, obstruction of the vena cava and other constitutional disturbances.

Irradiation consisted of dose of
2,161 roentgens in twelve
was relieved to some ext
and cough and dy
Medias and visceral
liev vasive pain
was n 50
the owed
oat typ
itive,
cell t.

ERNEST

GENEVE 35

COLLEGE INTERNATIONAL DE CHIRURGIENS

FOUNDED BY DR. MAX THOREK

The Journal of the International College of Surgeons

Official monthly publication of the International College of Surgeons

Editor-in-Chief
MAX THOREK, M.D., Sc.D., LL.D., F.B.C.S., F.I.C.S., F.P.C.S. (Hon.), F.R.S.M.

Associate Editor
PHILIP THOREK, M.D., F.A.C.S., F.I.C.S.

Consulting Editor
MORRIS FISHBEIN, M.D., F.I.C.S. (Hon.)

Assistant Editors
DOROTHY LANGLEY AND PAULA GOLICK

Specialty Editors

Cardiovascular Surgery
Bert Hollis Cotton, M.D., F.I.C.S., D.A.B.
Los Angeles, California

Genitourinary Surgery
Michael K. O'Heeron, M.D., F.A.C.S., F.I.C.S
Houston, Texas

Neurologic Surgery
James W. Watts, M.D., F.A.C.S., F.I.C.S.
Washington, D. C.

Obstetric and Gynecologic Surgery
J. P. Greenhill, M.D., F.A.C.S., F.I.C.S.
Chicago, Illinois

Occupational Surgery
Chester C. Guy, M.D., F.A.C.S., F.I.C.S.
Chicago, Illinois

Ophthalmologic Surgery
Paul C. Craig, M.D., F.A.C.S., F.I.C.S.
Reading, Pennsylvania

Orthopedic Surgery
Edward L. Compere, M.D., F.A.C.S., F.I.C.S.
Chicago, Illinois

Otolaryngologic Surgery
Francis L. Lederer, M.D., F.A.C.S., F.I.C.S.
Chicago, Illinois

Plastic and Reconstructive Surgery
Neal Owens, M.D., F.A.C.S., F.I.C.S.
New Orleans, Louisiana

Proctologic Surgery
Harry E. Bacon, M.D., F.A.C.S., F.I.C.S.
Philadelphia, Pennsylvania

Surgery of Thyroid, Parathyroids and Thymus
Arnold S. Jackson, M.D., F.A.C.S., F.I.C.S.
Madison, Wisconsin

Thoracic Surgery
Thomas J. Kinsella, F.A.C.S., F.I.C.S.
Minneapolis, Minnesota

Allied Sciences
Dr. Paul Bernard Szanto, F.A.C.P., F.I.C.S., Chicago, Illinois

---

Official Journal of the International College of Surgeons, Published Monthly
PUBLICATION OFFICE: 1516 Lake Shore Drive, Chicago 10, Ill.
Entered as second class matter at the post office at Chicago, Ill. under the act of March 3, 1879
Yearly Subscription: Domestic and Foreign, $12.00
Copyright 1956, by the International College of Surgeons

The Journal of the International College of Surgeons

Official monthly publication of the International College of Surgeons

CONTENTS

VOLUME XXV, NUMBER 5
MAY, 1956

ABDOMINAL AND GENERAL SURGERY

Intestinal Obstruction: Report on 12,614 Cases in Japan 541
Kiyoshi Saito, M.D., F.I.C.S., Tokyo, Japan

Chromoparasitic Verrucose Dermatitis (Phialophoromycosis): Surgical Technic 545
Roberto Farina, M.D., F.I.C.S., Sao Paulo, Brazil

Total Pancreatectomy 551
Ichio Honjo, M.D., F.I.C.S., Kyoto, Japan

Substitute for Stomach After Total Gastrectomy: Use of Right Half of Colon 558
Karl C. Jonas, F.A.C.S., F.I.C.S., Philadelphia, Pennsylvania

Adenomatous Polyp of Descending Portion of Duodenum Simulating Bleeding Peptic Ulcer 562
Arnold Gottesman, M.D., F.I.C.S., Jackson Heights, New York

Appendectomy Versus Hemicolectomy for the Colonic Type of Carcinoma of the Appendix 566
Willard J. Kiser, M.D., F.I.C.S., Laurel G. Case, M.D., Leo P. Cawley, M.D., and Bert E. Stofer, M.D., Wichita, Kansas

GENITOURINARY SURGERY

Induced Hydronephrosis to Expedite Removal of Incarcerated Small Renal Calculi.... 571
John W. Dorsey, M.D., F.A.C.S., F.I.C.S., Long Beach, California

Urologic Aspects of Pelvic Phlebography 578
Arminio de Lalor Motta, M.D., F.I.C.S., Recife, Brazil

OBSTETRIC AND GYNECOLOGIC SURGERY

Pelvic Surgery in Women: Intra-Abdominal Complications 585
Leonard Cowan, M.D., C.M., F.I.C.S., Regina, Saskatchewan, Canada

OPHTHALMOLOGIC SURGERY

Head Tilting in the Diagnosis of Ocular Muscle Disturbances 590
William E. Krewson, M.D., F.A.C.S., F.I.C.S., Philadelphia, Pennsylvania

ORTHOPEDIC SURGERY

Denervation of the Hip Joint 595
Luiz Gustavo Wertheimer, M.D., F.I.C.S., Sao Paulo, Brazil

OTORHINOLARYNGOLOGIC SURGERY

Carcinoma of Larynx 603
Burton J. Soboroff, M.D., F.A.C.S., D.A.B., Chicago, Illinois

COLLÈGE INTERNATIONAL DE CHIRURGIENS
GENEVE 35
FOUNDED BY DR. MAX THOREK

The Journal of the
International College of Surgeons
FOUNDED IN GENEVA, SWITZERLAND, 1935 - INCORPORATED IN WASHINGTON, D. C., 1940

Vol. XXV MAY, 1956 No. 5

Abdominal and General Surgery

Intestinal Obstruction: Report on 12,614 Cases in Japan

KIYOSHI SAITO, M.D., F.I.C.S.
TOKYO, JAPAN

THROUGH the courtesy and cooperation of some 175 hospitals and clinics in Japan, I have been able to collect data on many cases over a period of nineteen years. Having studied the data from various standpoints and compared them with those contained in reports from other countries, I should like to mention several points which, in my opinion, are of general interest.

Needless to say, mechanical obstruction carries a high incidence. It is treated by operation, on an average, in 92 per cent of cases. There has been little change in this percentage during the past nineteen years, nor, so far as I can determine, has the number of cases in which treatment is nonsurgical increased to any significant extent. Recently an increasing number of surgeons have been resorting to the intestinal suction tube, but I do not anticipate that this method will be used either widely or easily in Japan, unless certain necessary improvements are made in the tubes available. I have designed a tube suitable for Japanese patients, but as yet it has not given satisfactory results.

In Japan the mortality [illegible] of intestinal obstruction [illegible] varies from 3.5 to 32 [illegible]

From the Department of Surgery, Japan Medical College, Tokyo.

Read at the Twentieth Annual Congress of the United States and Canadian Sections, International College of Surgeons, Philadelphia, Sept. 12-15, 1955.

Submitted for publication Sept. 21, 1955.

hospital. The average total mortality rate is rather high—23 per cent.

Judged by the annual mortality figures, the results of treatment are improving steadily and substantially.

If one divides the entire period of investigation (nineteen years) into three terms, the mortality rate in the third term is 19 per cent. During the last three years of this study it has dropped to 17 per cent. The incidence of death occurring within five days after the operation is below 10 per cent for all the cases studied.

From observations of 3,518 cases followed up during the same period in some 16 hospitals and clinics, it is apparent that the results of treatment are improving in the same manner. As a result of the introduction of chemotherapy, the incidence of acute peritonitis has decreased. For this reason, it is assumed the incidence of intestinal obstruction has also decreased, but I have ascertained that this assumption is not justified. Simple obstruction due to kinking was observed in 33 per cent of the total number of cases, and this percentage is indeed high. Recently it has increased to 40 per cent. On the other hand, better results of treatment have greatly reduced mortality.

Strangulation due to bands was observed in 12 per cent of the cases. Although the mortality rate of this condition is rather high, the results of treatment have recently improved and the aforementioned percentage is gradually decreasing.

Volvulus was present in 10 per cent of the cases. The results of treatment of this condition are extremely bad and have not shown any improvement recently; the incidence, however, is decreasing.

The incidence of intussusception, 18 per cent, is also decreasing. It is interesting to note, however, that the results of treatment of intussusception have not improved at all. I have investigated the cause in detail and wish to report on my observations thus far. I have discovered that the bad results of operative reduction of intussusceptions in infants are the main cause of the unfavorable statistics. The simple operative procedure used in the treatment of infants has not produced good results; the results of major operations have improved, as I shall explain later. If as much attention were paid to the simpler procedure as is given to the major operations, more satisfactory results might be obtained. Operation for intussusception is not always necessary. Most Japanese patients prefer treatment by barium enema. Of course, operation is not a bad method if it is carefully done.

The incidence of intestinal obstruction due to tuberculosis is 18 per cent. This rate is fairly high throughout the world, but it is gradually decreasing, and the recent results of treatment have shown improvement.

The incidence of intestinal obstruction due to cancer is 5 per cent and the mortality rate, 40 per cent, extremely high.

The number of cases in which anastomosis is done shows a decrease. The use of intestinal resection is gradually increasing, and the results of this treatment are apparently taking a favorable direction.

A surgically created intestinal fistula is used, as a rule, when the patient is in a critical condition, and the fact that the employment of this method in Japan is not decreasing shows that the number of "critical cases" is not decreasing. A favorable tendency, however, is observable as to the results of treatment.

Twenty years ago the incidence of postoperative intestinal obstruction was only 10 per cent; recently it has increased to 30 per cent. Nevertheless, the results of treatment have become favorable. In 70 per cent of the cases postoperative obstruction is due to kinking; in 20 per cent, to strangulation due to bands. Also, this type of obstruction in most cases is the result of adhesions. In other words, intestinal obstruction due to postoperative adhesions is most important among the various types of obstruction.

If one reviews the recent main causes of favorable results from treatment, one is impressed by two facts: First, the incidence of volvulus and strangulation, the results of treating which have so far been unfavorable, has decreased, and second, the incidence of intestinal obstruction due to adhesions, the results of treating which have been favorable so far, has increased. As to the second cause, I presume there is a close relation between the increased number of patients with postoperative intestinal obstruction and the favorable results of treatment as a whole.

With reference to previous operations in this series, operations for appendicitis had been done in about 50 per cent, and this percentage has not shown any remarkable change during the nineteen-year period. In Japan, cases of critical peritonitis due to appendicitis are rarely encountered, and it is considered that the treatment of appendicitis has been satisfactory. The number of cases of intestinal obstruction after its operative treatment, however, has not decreased. I have also discovered that the appendicitis in question is often only "appendicitis catarrhalis"; therefore, I dare say, once the surgeon's hands have entered the peritoneal cavity, postoperative intestinal obstruction is expected. The study of adhesions has been continued for a long time, but there are still important new problems to be solved in this field.

I have made an experimental study of intestinal obstruction and of the pathologic changes following its removal. One of the important changes is anoxia of the liver. To relieve this condition, I am convinced that aortification of the portal vein—in other words, increase of oxygen content in the portal blood—is the most rational and effective method. Accordingly, I have made experiments with intraportal transfusion of blood saturated with oxygen and also with the intra-intestinal use of oxygen, and have found the treatment most effective.

SUMMARY

A statistical observation of intestinal obstruction in Japan is presented. Remarkable progress in treatment has been made there during the past ten years. Although the intestinal tube has not been used commonly in Japan, the results of treatment have been advanced to the same extent as in other countries. In connection with this remarkable progress, the author notes the ironical fact that the increase in the number of cases of postoperative obstruction is its main cause. He recommends adoption of the intraportal transfusion of blood saturated with oxygen and the intra-intestinal use of oxygen in treatment.

ZUSAMMENFASSUNG

Es werden statistische Untersuchungen über den Darmverschluss in Japan vorgelegt, wo in den letzten zehn Jahren bemerkenswerte Fortschritte in der Behandlung der Erkrankung zu verzeichnen sind. Obgleich in Japan die Darmsondierung nicht allgemeine Verwendung findet, stehen die Behandlungsergebnisse nicht hinter denen anderer Länder zurück. Im Zusammenhang mit diesen erheblichen Fortschritten weist der Verfasser auf den ironischen Tatbestand hin, dass der Hauptgrund dafür im Anstieg der Anzahl der Fälle von postoperativem Darmverschluss liegt. Zur Behandlung empfiehlt er die Anwendung intraportaler sauerstoffgesättigter Bluttransfusionen und die intraintestinale Zuführung von Sauerstoff.

RÉSUMÉ

Un exposé statistique d'occlusion intestinale au Japon est presenté. Dans ce pays on a fait du progrès remarquable dans le traitement pendant les derniers 10 ans. Malgré que le tube intestinale n'est pas encore en usage géneral au Japon, les résultats du traitement on fait le même progrès que dans les autres pays. A l'égard de ce progrès remarquable l'auteur constate le fait ironique que le nombre des cas d'occlusion intestinale postopératoire est la cause principale. Il recommende l'adoption de la transfusion sanguine, saturée d'oxygène, intraportale et l'usage intraintestinale de l'oxygène.

SUMARIO

Uma observação estatística de obstrução intestinal no Japão é apresentada. Notável progresso no tratamento tem sido feito nos últimos dez anos. Embora o tubo intestinal não tenha sido comumente usado no Japão, os resultados de tratamento apresentam o mesmo adiantamento que os de outros países. Em relação com êste notável progresso, o autor observa o fato irônico de que o aumento do número de casos de obstrução pós-operatória é a sua principal causa. Recomenda que seja adotada a transfusão intraportal de sangue saturado de oxigênio e o uso intraintestinal de oxigênio no tratamento.

RIASSUNTO

Viene presentata una statistica delle occlusioni intestinali in Giappone. Notevoli progressi nella cura sono stati conseguiti negli ultimi 10 anni, e benchè l'impiego del tubo intestinale non sia ancora generalizzato, i risultati nel loro complesso sono paragonabili a quelli ottenuti negli altri paesi. Viene segnalato anche il fatto che si è avuto un grande aumento nel numero dei casi di occlusione post-operatoria. L'autore raccomanda l'impiego di trasfusioni intraportali di sangue saturo di ossigeno e l'uso dell'ossigeno intraintestinale.

RESUMEN

Se presenta una estadística de la obstrucción intestinal en el Japón. Durante los últimos diez años el tratamiento ha progresado grandemente. Aun cuando la sonda intestinal no es frecuentemente usada en el Japón, los resultados terapeúticos han mejorado en el mismo grado que en otros países. En relación con este progreso, el autor señala el hecho irónico de que en la mayoría de los casos, la causa es operatoria. Recomienda la transfusión intraportal de sangre saturada así como el uso intraintestinal de oxígeno.

Future advancement in surgery is definitely linked with advancement of the science of physiology, and the surgeon of the future will think and operate along physiological lines more and more.

—*Partipilo*

Chromoparasitic Verrucose Dermatitis (Phialophoromycosis)

Surgical Treatment

ROBERTO FARINA, M.D., F.I.C.S.*

SAO PAULO, BRAZIL

VERRUCOSE dermatitis is a disease of fairly infrequent occurrence, caused by fungi of the genus Phialophora belonging to the Hyphomycetes group, the primary infection having a saprophytic origin.

With regard to the classification of fungi that cause the disease, Langeron,[1] an authority on the subject, expresses the following opinion: "En résumé, un seul type de champignon, pouvant présanter à la fois ou séparement les trois états, Hormodendrum, Trichosporium (Acrotheca) et Phialophora, est l'agent des chromomycoses. Ces affections, tout en étant assez rares, ont une très large distribution géographique, Continent américain (États-Unis, Brésil, Uruguay, Argentine, Costa Rica, Guatemala), Porto Rico, Algérie, Russie, Japon, Java, Sumatra et peut-être Guinée française et Thodésie.

"C'est un parfait example de réduction morphologique parasitaire (formes fumgoides) et de polymorphisme saprophytique (trois formes conidiennes pouvant coéxister). Elles démontrent aussi a l'evidence l'origine saprophytique de cette mycose, maladie forestiere mondiale."

Farm workers are most liable to this disease, the infection, which takes place in small lacerations of the skin (cuts) through which the fungi penetrate. Consequently, this type of mycosis is likely to occur mostly in the foot, leg and thigh and later in the hand, forearm and arm.[2] Facial (Kano's case[3]) and thoracic-facial involvement (Pereira's case[4]) are rarer; conjunctival involvement is exceptional.[5]

This clinical entity is still known as chromomycosis, black blastomycosis, espundia, "figueira" (fig tree), "sundo," or any of several other names. As is indicated by the title of this paper, it has an anti-unesthetic and disagreeable appearance, and, although it has no direct influence on the sufferer's general state of health, it has attracted the attention of specialists.[6]

The histopathologic picture of chromoparasitic verrucose dermatitis varies widely and is not typical of the disease.[7] A clinicodermatologic examination alone is not sufficient to confirm the diagnosis. In fact, a large number of dermatoses have a clinicodermatologic appearance similar to that of the disease under consideration — leishmaniosis, blastomycosis, sporotrycosis, tuberculosis, chancre and syphilis. The diagnosis is correct only when the parasite has been discovered either by direct examination or by culture. The microscopic picture of the disease[8] is made up of dermal and epidermal alterations. There is hyperplasia of the epidermis, with hyperacanthosis, hyperkeratosis and granulosis. In the derma one observes papillomatosis, as well as micro-abscesses with polymorphonuclear leukocytes and eosinophils. The parasites, isolated or in groups, are located [illegible]

---

*Head of the Department of Plastic and Repair Surgery of the Dermatological Clinic (Prof. J. Pupo's service) of the Sao Paulo Faculty of Medicine, Hospital das Clinicas, Sao Paulo.

Submitted for publication Jan. 27, 1956

the Langhans type or among neutrophils.[9]

Apart from medical means used in the treatment of this disease, all of which are highly precarious, one must say that surgical means, being more radical, have contributed most efficiently toward curing verrucose dermatitis. Accordingly, the following methods have been indicated: exeresis of the lesions with an ordinary or an electric scalpel or by simple electrocoagulation,[10] as well as actual amputation of the diseased limb. The first two methods have a disadvantage in that they leave large raw areas when the lesions are extensive, and this alone is a contraindication; amputation, for reasons based on etiologic and pathologic grounds, is not indicated, even when the entire tegument of the limb is affected.

The method I use is confined to an ample electrosurgical exeresis of the lesions, followed by a free skin graft. This treatment was suggested by a histologic study of the lesions.

According to the majority of writers on the subject,[11] the disease is strictly localized in the skin and subcutaneous cellular tissue. The involvement of other cutaneous areas is effected contiguously or through the lymphatic system. When effected through the lymphatic system, it usually reaches the adjacent zones—only rarely the distant ones.

Furthermore, involvement of an area at a distance has a regional character. The infection is seldom propagated by the lymphatic system from the original lesion, and does not become generalized by means of either hematogenic or auto-inoculative spread. Tibirica[7b] appears to have found parasites in the muscular tissue. Aleixo[10a] has expressed the opinion that the disease can go straight to the natural cavities and injure the organs contained therein.

Now, considering that the presence of the parasite outside the skin and subcutaneous tissues is exceptional and even doubtful, one could easily plan a surgical course of action: mass removal of the affected skin from the pathologic limb, with the aponeurosis as the limit. In the same operative session, I repaired an extensive loss of substance by a free skin graft of the superficial intermediary type. This treatment, moreover, is the same as that I have been advocating for some years past.[12]

Operations were performed on 5 patients, all with leg ailments. Special anesthesia was used.

REPORT OF CASES

CASE 1.—A. A. C., a married Negro Brazilian farm worker aged 39, of Tupassiguara, State of Minas Garais, had verrucose dermatitis. Culture of the parasite classified it under the Phialophora species. (Patient referred by Dr. Carruti).

CASE 2.—J. P. O., a white married Brazilian farm worker 65 years old, of Bariri, stated that the ailment had begun on his left foot twelve years earlier. Histopathologic examination confirmed the diagnosis of chromomycosis. Culture of the parasite classified it under the Phialophora genus sp. (Patient referred by Dr. C. S. Lacaz).

CASE 3.—J. S., a white married Austrian workman 59 years old, of Casa Verde, São Paulo, had had verrucose lesions on the right leg for ten years. Direct examination revealed chromomycosis. Histopathologic examination confirmed this diagnosis; culture of the parasite classified it under the genus Hormodendrum. (Patient referred by Dr. G. V. Curban).

CASE 4.—B. M. S., a white married Brazilian farm worker, 48 years old, had had verrucose lesions on the left foot and leg for more than twenty years. Direct examination revealed chromomycoses. No culture was made of the parasite. (Patient referred by Dr. H. Zilberberg).

CASE 5.—A. M., a white married Brazilian housewife 40 years old, of Assis, State of São Paulo, had had verrucose lesions on the posterior aspect of the lower third of the right leg for ten years. Direct examination revealed the presence of the parasite, no culture having been made. (Patient referred by Dr. L. D. Petricio).

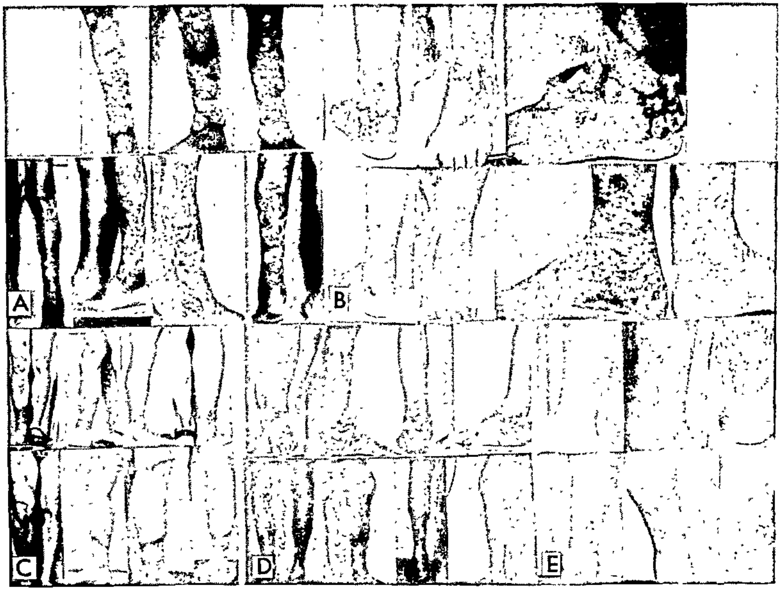


Fig. 1. — *A, B, C, D* and *E*, chromomycosis of lower limbs before and after operation (see text).

Local Physical Examination.—In every one of the cases dermatitis was morphologically characteristic, with verrucose lesions predominating. Between the lesions, in some instances, were islands of sound whole skin. The lesions were spread over all parts of the lower limb, from the foot upward, almost reaching the thigh.

Symptoms and Signs. — These were scarce. Some patients complained of a burning (sic) at night and a certain ardor on deambulating the diseased leg. The vegetating lesions bled easily at the least trauma. No ganglionic reaction was evident, although this customarily appears when there is secondary infection. In the cases reported, no lymphangiitis and no lymphedemic phenomena were noted.

RESULTS AND COMMENT

Successful results were generally obtained by surgical treatment. The burning sensation in the diseased limb and the ardor on deambulation completely disap-

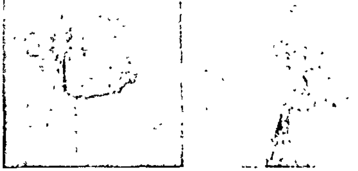


Fig. 2.—Chromomycosis of buttocks, before and after operation.

peared. The cosmetic appearance was satisfactory.

I am convinced, therefore, that this surgical technic represents a contribution to the effective treatment of verrucous dermatitis. Obviously, treatment with iodates should be given simultaneously, so as to activate any focus more or less deeply embedded that might otherwise escape the surgeon, and thus prevent a relapse. In 1 case of my own (patient J. P. C.) a small nodule appeared in the transplanted tissue six months later. In performing decortication, some remnant of pathologic tissue was probably left, and this produced the recurrent nodule. The patient refused a second operation; only medical treatment, therefore, was employed.

SUMMARY

The author presents 5 cases of chromoparasitic verrucose dermatitis (phialophoromycosis) of the lower limbs, treated as the limit. The resulting extensive loss of substance is repaired with a free skin graft placed directly over the aponeurotic plane. The author concludes that, when confronted with the possibility of a relapse, one should apply joint treatment with iodates and repeat the surgical procedure. He describes cursorily the etipathogenesis of the disease, synonymy, localization, symptoms, diagnosis and prognosis. He states that the dermatologic chart is not sufficient for a diagnosis. One must (1) make a direct search for the parasite between the lamina and laminula in the substance withdrawn from the lesions; (2) study the fungus by culture, which enables one to identify it, and (3) make a histopathologic examination when other proofs have failed.

ZUSAMMENFASSUNG

Der Verfasser berichtet über fünf Fälle von chromoparasitärer verruköser Dermatitis (Phialophoromykose) der unteren Gliedmassen, die radikal behandelt wurden. Der entstehende umfangreiche Substanzverlust wird durch ein freies Hauttransplantat ersetzt, das direkt auf die Fläche der Aponeurose aufgesetzt wird. Der Verfasser kommt zu der Schlussfolgerung, dass in Fällen eines möglichen Rückfalls eine Behandlung mit Jodpräparaten und gleichzeitiger Wiederholung des chirurgischen Eingriffs angewandt werden sollte. Er beschreibt in grossen Zügen die Ätiologie und Pathogenese der Krankheit, ihre Nomenklatur, Lokalisation, Symptome, Diagnose und Prognose. Er bemerkt, dass das dermatologische Bild für die Diagnosestellung nicht ausreicht. Es ist notwendig, 1) in dem aus den Krankheitsherden gewonnenen Material direkt nach dem Parasiten zu suchen, 2) Kulturen zu studieren, an denen man den Pilz erkennen kann und 3) histopathologische Untersuchungen anzustellen, wenn andere Wege des Nachweises versagen.

RESUMEN

El autor presenta 5 casos de dermatitis verrucosa cromoparasitaria (fialoforomicosis) de los miembros inferiores tratados al máximo. La grand pérdida de subtsancia que se produce se repara por medio de un injerto colocado directamente sobre el plano aponeurótico. El autor concluye que, cuando se plantea la posibilidad de recidiva, se debe utilizar tratamiento coadquvante con yoduros y además repetir el procedimiento quirúrgico. Describe la etiopatogenia de la enfermedad, su sinonimia, localización, síntomas, diagnóstico y pronóstico. Establece que la imagen dermatológica no basta para el diagnóstico. Eiempre se debe hacer: (1) La investigación directa del parásito entre la lamina y la laminula, en la substancia procedente de las lesiones. (2) El estudio del hongo por cultivo lo cual permite identificarlo y (3) El exámen histopatológico, cuando las pruebas anteriores han fallado.

RÉSUMÉ

L'auteur présente 5 cas de dermatite verruqueuse chromoparasitique (phialophoromycosis) des jambes traités jusqu'à la limite. La perte extensive de substance est restaurée par greffon libre de peau, placé directement zur la surface aponévrotique. L'auteur conclut qu'en cas de récidive on devait appliquer un traitement combiné de jode et répétion de la procédure chirurgicale. Il décrit brèvement la pathologie étiologique de la maladie, synonyme, localisation, symptomes, diagnostic et prognostic. Il constate que l'aspect dermatologique ne suffit pas pour le diagnostic. Il faut 1) faire la recherche directe du parasite entre la lamine et laminula de la substamce prise de la lésion. 2) étudier le parasite en culture, ce qui permet son identification et 3) faire un examen histopathologique, si les autres méthodes étaient insuffisantes.

SUMARIO

O autor apresenta cinco casos de dermatite verrucosa cromoparantica (phialophormycosis) dos membros inferiores, tratados cirurgicamente por ampla remoção das lesões com o plano aponeorótico como limite. A resultante extensiva perda de substancia é reparada com um enxerto de pele livre colocado diretamente sôbre o plano aponeorótico. O autor conclui que, quando exista a possibilidade de um fracasso, deve-se fazer tratamento com iodetos e repetidos processos cirurgicos. O autor descreve minunciosamente a etiopatogenia da doença, sinonimia, localização, sintomas, diagnósticos e prognóstico. Deve-se (1) fazer uma pesquiza direta da substancia retirada da lesão e colocada entre a lamina e laminula; (2) estudar o fungus de modo a identifica-lo e (3) fazer um exame histopatologico quando outras provas falharem.

RIASSUNTO

L'autore presenta 5 casi di dermatiti verrucose cromoparassitiche (fialoforomicosi) degli arti inferiori trattati chirurgicamente con ampia rimozione delle lesioni fino alla fascia aponeurotica. La vasta perdita di sostanza che ne riporta viene ricoperta con un innesto libero di cute applicata direttamente nella fascia aponeurotica. L'autore conclude che in rapporto alla eventualità della recidiva si può associare il trattamento iodico ed eventualmente un reintervento. Egli descrive rapidamente l'etiopatogenesi della malattia, la localizzazione, i sintomi, la diagnosi e la prognosi. Occore 1) fare una diretta ricerca del parassita al microscopio sulla sostanza prelevata dalla lesione; 2) studiare il fungo e identificarlo e 3) fare un esame istopatologico qualora abbiano fallito le altre ricerche.

REFERENCES

1. Langeron, M.: Precis de Mycologie. Paris: Masson et Cie, 1945.

2. Carrion, A. L.: Chromoblastomycoses, Puerto Rico J. Pub. Health and Trop. Med. 10:543-545, 1934. Cavalcanti, J. T. M.: Contribuicao ao estudo das Chromoblastomycoses. Thesis, Off. graficas do Jornal do Brazil, Rio de Janeiro, 1924. Fialho, A.: Dermatite verrucosa, An. Paul. Med. e Cir. 23:191, 1932. Martin, D. S.; Baker, R. D., and Conant, N. F.: A Case of Verrucous Dermatitis Caused by Hormodendrum Pedrosoi (Chromoblastomycosis) in North Carolina, Am. J. Trop. Med. 16:593-620, 1936. Merine, J.: Cas de chromomycose de la peau avec lesion des ganglions lymphatiques regionaux, Ann. Dermat. et de Syphil. 9: 122-237, 1938.

3. Kano, K.: Cited by Aleixo, J.: Thesis, Belo Horizonte, 1946.

4. Pereira, A. C.: Cited by Tribirica, P.Q.T.: Thesis, Ed. Rev. Tribunais S. Paulo, 1939.

5. Rocha, H.: Cromomicosa conjuntival primitiva, *Ophthalmoscope 3:205-211, 1943.*

6. (a) Aleixo, J., and Castro Ribeiro, C.: Sobre 2 casos de chromoblastomicose, Brazil Med. 50: 494-495, 1936. (b) Almeida, F.: Chromomycose, Arq. Biol. 20:68-71, 1939; (c) Cromoblastomicose, Am. Bras. Derm. e Sifil. 15:37-38, 1940. (d) Gomes, J. M.: Dermatite verrucosa, Bol. Soc. Med. Cir. de S. Paulo 4:26-27, 1921. (e) Gomes, J. M., and Pessoa, S. B.: Reproducao experimental da dermatite verrusoca, Brazil Med. 43:255-257, 1929. (f) MacKinnon, J.: Estudio del primer case Uruguayo de chromoblasto[illegible]sis y revista critica

sobre la enfermedad, Arch. Urug. Med. Cir. y Especial 5:201-226, 1934. (g) Maciel, J.: Contribuicao a historia das chromoblastomycoses brasileiras 38:389-391, 1930. (h) Moore, M.: Chromomycosis, Folia Biol. 65:266-269, 1936. (i) Neves, A.: Onychromomycose por Acrotheca pedrosoi (Brumpt 1921), Brasil Med. 43:69-70, 1929. (j) Pedroso, A., and Gomes, J. M.: Sobre 4 casos de dermatite verrucosa produzida pela Phialophora verrucosa, An. Paul. Med. Cir. 11:53-61, 1920. (k) Silva, F., and Araujo, E.: Caso de chromoblastomycose, Brasil Med. 44:539-541, 1930.

7. (a) Pereira, O. B.: Mycologia das chromomycoses. Thesis, Centro da Boa Imprensa, Porto Alegre, 1938. (b) Tibirica, P. Q. T.: Anatomia patologica da dermatite verrucosa cromomicotica. Thesis: E. Rev. Tribunais, S. Paulo, 1939.

8. Aleixo.[6a] Tibirica.[7b]

9. Lobo, J.: Contribuicao ao estudo das blastomycoses. Thesis, Recife, 1933.

10. (a) Aleixo, J.: Subsidio ao estudo da cromomicose. Thesis, Belo Horizonte, 1946. (b) Moura, P.: Dermatite verrucosa: Tratamento cirurgico, Arq. Brasil de Med. 19:527-531, 1929.

11. Almeida, F.: Mycologia Medica, Cia. Melhoram de S. Paulo, 1939. Fonseca, O., and Area Leao, A. E.: As Chromoblastomycoses, Rev. de Med. e cir. do Brasil 38:197-216, 1930. Lacaz, O. S.: Chromomycoses, Brasil Medico 12:555-560, 1938.

12. (a) Farina, R.: Tratamento cirurgico da cromomicose, Rev. Hosp. Cli. 5:33-36, 1950. (b) Lobo, J.: Chromoblastomycoses, Rev. Med. Pernambuco 1:163-167, 1931.

◆

Serious note was taken by sixteenth-century English surgeons of the possibility that a cadaver presented for dissection might suddenly come to life again. Witness the following notice in the Minutes of the Court of Assistants (sic) on July 13, 1587:

"*Item.* Yt ys agreed, that yf anie bodie wch shall, at anie tyme here after, happen to be brought to our Hall, for the intent to be wrought upon by Thanathomistes of our Companie, shall revyve or come to lyve agayne, as of late hath ben seene, The charges aboute the same bodie, so revyvinge, shal be borne, levied, and susteyned, by such Pson or Psons, who shall happen to bringe home the Bodie, and further shal abide suche order or Ffyne, as this House shall awarde."

Total Pancreatectomy

ICHIO HONJO, M.D., F.I.C.S.

KYOTO, JAPAN

I HAVE been studying total pancreatectomy with special emphasis on postoperative complications and the means of preventing them.

Having performed 8 total pancreatoduodenectomies (one of the patients is living a healthy life at the time of writing, three years after the operation) I am convinced that this operation may well be more widely applied to man. My results imply the important physiologic criteria that cannot be deduced from knowledge of partial pancreatectomy.

Furthermore I have performed a number of experimental investigations on the dog (total pancreatectomy with and without duodenectomy, ligation of the pancreatic duct, and other procedures) and compared the data so obtained with those on total pancreatoduodenectomy in man.

I shall avoid well-known facts that have already been clarified by other authors, and report only the data which concern urgent and important problems related directly to the life of the patient.

1. *Efficiency of the Gastrointestinal Tract After Total Pancreatoduodenectomy.*—In operating on human patients, I make it a rule to do total pancreatectomy combined with resection of the duodenum, because there is the possibility of necrosis of the duodenal wall if one tries to resect the pancreas alone. Moreover, in case of cancerous disease, total pancreatoduodenectomy is preferable as being more radical.

In my experiments on dogs, in order to evaluate the efficiency of the gastrointestinal tract, I adopted the digestion and absorption test, determining the amounts of organic constituents (protein, fat and carbohydrate) in the feces as compared with those of the ingested food, and calculated the approximate percentage of food utilized.

After the operation the digestion was found to be so heavily impaired that the feces resembled vomitus and were greatly increased in volume.

In spite of the administration of pancreatin together with methionine, the absorption rate revealed a marked fall. That is, *the absorption rate of carbohydrate* dropped about 20 per cent and that of protein about 54 per cent.

As regards fat, the rate of absorption differed considerably in different dogs and, in the worst cases, turned out to be negative indicating that part of the fat in the feces is a product of endogenous excretion. I tried, therefore, to calculate the average absorption rate of fat by recording the total fat intake, together with the fat in the feces, in all the animals investigated. The result showed that the average rate of fat absorption dropped about 68 per cent.

In experiments in which pancreatin and methionine were not given, even lower values were obtained.

In man, in my series, the digestion and absorption test was done in 3 cases after the operation.

Although the average absorption rate of protein and fat dropped 25 per cent and 43 per cent respectively, it is remarkable that the rate of carbohydrate preserved almost the normal value.

From these data it is reasonable to presume [illegible] m[illegible]tains [illegible]uch better

---

From the First Surgical Division, Kyoto University Medical School Hospital.

Submitted for publication September 24, 1955.

capacity for absorption after total pancreatoduodenectomy than does the dog.

I investigated also the capacity of absorption one year after the operation and compared it with the average value observed relatively soon after the operation. There was no appreciable difference between the two. I do not expect, therefore, that the postoperative absorption capacity may recover by compensatory functioning of the other organs.

2. *Development of Fatty Liver After Total Pancreatoduodenectomy.*—Some authors have reported that remarkably fatty livers usually developed after total pancreatectomy in dogs and that the dogs died of severe disturbances of liver function. It was also reported that after the operation there occurred a striking reduction in the amount of esterified cholesterol in the serum, even to zero. If these phenomena in the experiments on dogs are also true of human patients, one must hesitate to carry out this sort of operation in clinical practice.

I wish to note here that the fatty liver I have mentioned is not the kind that appears in all cases soon after the operation and has its origin in postoperative diabetes mellitus. The fatty liver here referred to is the one that appears about six weeks after the operation notwithstanding the administration of insulin.

a. *Totally Pancreatoduodectomized Dog: With Administration of Pancreatin and Methionine.* Under administration of 5 Gm. of pancreatin and 2 Gm. of methionine per day, 6 animals survived for more than six weeks. The cholesterol ester ratio was maintained within the normal range throughout the operative course in all animals except one.

Without Administration of Pancreatin and Methionine. In dogs to which pancreatin and methionine were not administered the serum cholesterol-ester ratio fluctuated widely, but there was no tendency toward gradual decline in its value. Fatty liver was observed in only 1 dog out of 6 at autopsy.

b. *Totally Pancreatoduodenectomized Man:* The ester-cholesterol ratio was determined in 3 cases for a long period after the operation.

The first patient is still living three years after the operation and is in satisfactory condition without any medication except insulin. The serum cholesterol-ester ratio has been within the normal range throughout the postoperative course; consequently, there seems to be no possibility that fatty liver will develop.

The second patient has been suffering from obstructive jaundice of three months' duration and showed a marked disturbance of liver function at the time of admission. After the operation the serum cholesterol-ester ratio returned to normal and maintained its level for about thirty weeks. Because of the progress of hepatic cirrhosis, severe infection of the biliary ducts and the development of jejunal ulcer, however, the serum cholesterol-ester ratio began to fluctuate and gradually decrease, and the patient died one year after the operation.

The third patient died of gradually increasing anorexia and emaciation five months after the operation, in spite of the administration of methionine, Vitamin B_{12} and folic acid. The serum cholesterol-ester ratio began to decrease when the general condition deteriorated. At autopsy generalized tuberculosis was observed, with the formation of caverns in the left lung.

Fatty liver was observed in only 1 case, the last, but I could not detect any trace of fat accumulation in the other case and in 3 more cases in which the livers were examined at autopsy. Thus, fatty liver was observed in only 1 patient out of 6 who survived more than one month after total pancreatoduodenectomy.

These facts indicate that diet may play an important role in the pathogenesis of postoperative fatty liver.

Since man retains a much better postoperative capacity for absorption than does the dog, it is reasonable to presume that the risk of developing fatty tissue in man must be much less than in the dog.

Although I encountered fatty liver in 1 case, the patient in this case, as has been stated, died of the aggravation of tuberculosis. It has been generally accepted that fatty liver is apt to develop in certain cases of tuberculosis. One cannot, therefore, ascribe the occurrence of postoperative fatty liver solely to removal of the pancreas.

It would appear, therefore, that total pancreatoduodenectomy does not result in the development of fatty liver in man unless severe complications take place; in other words, the fatty liver develops postoperatively only in exceptional cases.

1. *Blood Sugar Level and Insulin Sensitivity After Total Pancreatectomy: Insulin Dose.*—It has been pointed out by some authors that for totally pancreatectomized dogs the dose of insulin should be reduced day by day after the operation, in order to prevent hypoglycemia. They have interpreted this phenomenon directly as the increase of sensitivity of animals to insulin and also have stated that this sensitivity is a characteristic sign of the development of fatty liver.

(a) *Totally Pancreatectomized Dog:* In my experiments, I injected a certain amount of insulin daily to keep the fasting blood sugar level at about 200 mg. per kilogram in the early morning.

I observed, under this condition, 26 dogs for more than three weeks after the operation. In this series it was necessary to reduce the insulin dose for only 6 animals, i.e., about 20 per cent of all the dogs investigated. Moreover, fatty liver developed in only 1.

It seems, therefore, incorrect to explain this phenomenon solely on the basis of fatty liver.

(b) *Totally Pancreatoduodenectomized Man:* I have encountered 6 patients whose levels of blood sugar were investigated for more than one month after the operation. One patient, who is still enjoying good health three years after the operation, has been constantly taking about 30 units of insulin per day, with no sign of hypoglycemia.

Summarizing the data on the other patients, I was led to reduce the dose of insulin when the patient was attacked by severe complications (jejunal ulcer, severe infection of the biliary ducts, hepatic cirrhosis, recurrence of cancer, aggravation of tuberculosis, etc.) and lost his appetite. If the patient had a good appetite and was not afflicted with any severe complications, I observed that there was no need to reduce the dose.

These observations on man indicate that the amount of insulin administered need not be reduced after total pancreatoduodenectomy as long as an adequate food intake is maintained.

2. *Insulin Test.*— I used the insulin test to estimate the sensitivity of the body to insulin at a certain point of time.

(a) *Totally Depancreatized Dog:* I injected intravenously, into a totally depancreatized dog in a state of fasting, a certain amount of insulin, and then recorded the blood sugar level at certain intervals for four hours after the injection. The time required to reach the lowest level became much longer. Also the time required for return to the previous level was prolonged beyond that recorded for normal dogs.

From determination of the assimilation index, which has been said to supply a numerical index of the grade of sensitivity, I have [illegible] the [illegible] for [illegible] mal ones; that is to say, the degree of insulin sensitivity was decreased after the operation. On this point I am obliged to correct my former idea.

(b) *Totally Pancreatoduodenectomized Man:* In man, I injected insulin subcutaneously and measured the level of blood sugar as aforedescribed. I was able to carry out this test several times on the same person at various intervals after the operation.

The blood sugar curves thus obtained were quite similar to one another and showed a unique figure as compared with the curves for a normal person. In other words, although the velocity of the decrease in blood sugar was slight, the blood sugar level fell steadily, and sometimes there were signs of hypoglycemia.

From determination of the assimilation index, I have observed that the patient became somewhat insensitive to insulin, in quite the same way as did the dog. In special circumstances, such as a state of fasting, both man and dog sometimes show symptoms of hypoglycemia after an insulin injection.

Since hypoglycemia after an insulin injection does not occur in normal persons, one is apt to misinterpret this phenomenon as caused by the increase of insulin sensitivity in totally depancreatized persons.

3. *Appearance of Anterior Lobe of Pituitary Gland After Total Pancreatectomy.*—In order to investigate the disturbed balance of postoperative sugar metabolism precisely, I have attempted to examine the histologic data on the anterior lobe of the pituitary gland, which is considered to have the most intimate relation to the pancreas with regard to sugar metabolism.

Using Creazan's staining method, I calculated the number of cells of each type in the anterior lobe of the pituitary gland after the method of Rasmussen. In this way I determined the ratio of the number of eosinophils and basophils to that of chromophobic cells. Comparing the ratios for totally depancreatized dogs with those for normal ones, I observed that both the eosinophils and the basophils showed a remarkable reduction in number after the operation.

In man, I had the chance to examine the pituitary gland histologically at autopsy. From this material I could deduce that the number of eosinophils and basophils were considerably reduced in man, as well as in the dog.

These observations of the pituitary gland undoubtedly indicate that the endocrine function of this organ decreases in its activity.

It has been generally pointed out that the amount of insulin required after total pancreatectomy is an unexpectedly small dose compared with that required in cases of endogenous diabetes mellitus. Moreover, the genesis of insulin-resistant diabetes mellitus is generally ascribed to hypofunction of the pituitary-adrenocortical system. It is natural, therefore, to suppose that the pituitary gland, which is regarded as the organ antagonistic to the pancreas with regard to sugar metabolism, will display its full effect after total pancreatectomy. One wonders, therefore, why a large amount of insulin is not used in the treatment of postoperative diabetes mellitus.

This discrepancy will be solved by the fact that the endocrine function of the anterior lobe of the pituitary gland is lowered after total pancreatectomy, although the disappearance of another hormone of the pancreas, "glucagon," must be taken into consideration.

Postoperative decrease of insulin sensitivity can be explained by the fact that the numerically decreased, yet still existing chromophil cells will continue to perform their function when confronted with the absence of the pancreas.

Postoperative hypoglycemia, which appears sometimes in a state of fasting of long duration, may be due to undernutrition in general, particularly in the liver, caused by the decreased efficiency of the gastrointestinal tract. Be that as it may, it has been ascertained by my study that the endocrine activity of the pituitary gland is lowered after total resection of the pancreas. At this point, one may say that a depancreatized dog spontaneously approaches the condition of Houssay's dog, the severity of whose depancreatogenic diabetes mellitus was decreased by subsequent resection of the pituitary gland.

4. *Development of the Jejunal Ulcer After Pancreatoduodenectomy.*—In totally pancreatoduodenectomized dogs jejunal ulcers are apt to develop, particularly in the neighborhood of the gastrojejunal anastomosis, and these dogs sometimes die of severe hemorrhage or perforation of the ulcer.

I have encountered this kind of ulcer in a high percentage of instances—19 out of 26 dogs suffered from ulcer formation.

Thereupon I tried to obtain some factors concerning the mechanism of ulcer formation after total pancreatoduodenectomy. I could not detect any difference between the dogs that were given pancreatin and methionine postoperatively and those that were not. Also, the percentage of ulcer formation was not influenced significantly by either complete or incomplete resection of the stomach.

Then I attempted to find some relation between the postoperative blood sugar level and the ulcer formation. In this experiment, although I tried to control the dose of insulin by determining the blood sugar level in a fasting state early every morning, this value fluctuated so widely throughout day and night that the dog was sometimes in a state of hypoglycemia.

I therefore divided these dogs into two groups—those which showed no sign of hypoglycemic shock throughout the postoperative course and those which did. As a result, I was able to determine that ulcers developed in all dogs which exhibited hypoglycemic shock; the dogs in which ulcers did not develop belonged to the group in which hypoglycemic shock did not occur.

To confirm this observation, I performed total pancreatectomy on dogs without resecting the duodenum, and divided these dogs into two groups, one of which was given a small dose of insulin to maintain the blood sugar level constantly above normal; the other group was given a large amount of insulin, occasional hypoglycemic shock being allowed. I observed that postoperative jejunal ulcer did not develop in the former group, although it developed in 33 per cent of the latter.

These data indicate that, if one wishes to prevent the formation of jejunal ulcer, it is advisable to try to preserve the blood sugar level relatively high above the normal value after total pancreatoduodenectomy.

I ascertained, at autopsy, that a jejunal ulcer had formed in one patient of this series.

5. *Ascending Biliary Duct Infection After Choledochojejunostomy.* — After total pancreatoduodenectomy, one must anastomose the common bile duct or the hepatic duct with the jejunum. I encountered a severe ascending biliary-duct infection in 1 patient. After choledochojejunostomy performed on the dog, the gallbladder was usually filled with intestinal contents and looked like a focus of infection in the biliary duct system.

Thereupon, I extirpated the gallbladder at the time of choledochojejunostomy on dogs and noted that the rate of infection of the biliary system was reduced from 73 to 25 per cent.

I then tried to investigate the functional activity of the gallbladder after choledochojejunostomy, even if the gallbladder was infected only to a slight degree. As an indicator of the organ's function I used the capacity for concentration of bile.

After ligation of the choledochus, the bile stagnates in the blood stream and the serum bilirubin level rises. If one extirpates the gallbladder concurrently with choledochojejunostomy, the serum bilirubin content rises much faster than before, because the capacity of the gallbladder for bile concentration is lost. By the use of this experimental method, one is able to estimate the bile-concentrating capacity of the gallbladder of a normal dog.

Next I made the following experiment: First I performed choledochojejunostomy. Then, more than a month after the first operation, I reopened the peritoneal cavity and ligated the choledochus, determining the value for serum bilirubin. In this experiment, the serum bilirubin level rose much faster than in the previous one, despite the presence of the gallbladder.

These results show clearly that the gallbladder can no longer display its normal activity in the concentration of bile after choledochojejunostomy. Because of this fact, I propose that extirpation of the gallbladder must be done concurrently with pancreatoduodenectomy, for the purpose of removing the focus of infection.

6. *Calcium Metabolism After Total Pancreatectomy.*—I began a study of calcium metabolism after total pancreatectomy because I had encountered one case of postoperative tetany.

I fed a test diet containing a certain amount of calcium both to normal dogs and to depancreatized dogs, and then compared the amount of calcium excreted in the feces of the two groups. I observed that the amount of calcium excreted in the feces of the depancreatized dogs increased noticeably, sometimes exceeding the intake. Nevertheless, the serum calcium level was almost within the normal range in the majority of depancreatized dogs. Moreover, the level of the diffusible serum calcium that probably is physiologically active was within an entirely normal range until nine weeks after the operation. Clinical signs of tetany, therefore, did not appear in the depancreatized dogs throughout a postoperative course of that duration.

Next I measured the amount of calcium contained in a rib of each dog at various stages after the operation. The amount of calcium contained in the rib of the depancreatized dogs was from one-fifth to one-half less than the average normal amount, as observed for three to twelve weeks after the operation. Osteoporosis was observed at histologic examination.

The reason for maintenance of the serum calcium level within the normal range despite the excretion of a large amount of calcium in the feces is probably the fact that the bone calcium was rapidly transported to the blood stream.

One patient in the series, as has been stated, revealed symptoms of tetany eight months after the operation and, at the same time, showed a marked decrease of serum calcium. This patient recovered, however, soon after an adequate intake of calcium was instituted.

Since a human patient preserves a better level of efficiency of the gastrointestinal tract after total pancreatectomy than does a dog, one cannot discuss the calcium metabolism in man as analogous to that in dogs, the experimental animal. It is advisable, however, not to neglect the possibility of calcium deficiency in man after the operation.

COMMENT

To summarize these data on man and dog, I was able to prevent the development of fatty liver in the dog after total pancreatoduodenectomy by the administration of pancreatin and methionine. Moreover, even when I did not give these drugs, I recognized fatty liver in only 1 case out of 6. Thus, in my experiments, fatty liver did not occur in dogs in such a high percentage as that reported in the literature.

One of the reasons for these discrepancies in the results may lie in the mode of feeding, because the animals were fed boiled rice and barley together with dried fish instead of raw lean beef and horse meat.

SUMMARY

The author presents a discussion of total pancreatomy, with emphasis on the prevention of postoperative complications. He points out the effect of this operation, and also of pancreatoduodenectomy, on man and on the experimental animal (the dog). Among the complications to be on one's guard against are fatty liver, hypoglycemia, insulin sensitivity, jejunal ulcer, ascending infection of the biliary ducts and disturbances of metabolic function.

ZUSAMMENFASSUNG

Der Verfasser erörtert die totale Bauchspeicheldrüsenresektion unter besonderer Berücksichtigung der Verhütung postoperativer Komplikationen. Er weist auf die Folgen sowohl dieser Operation als auch der Pankreatoduodenektomie am Menschen und am Versuchstier (Hund) hin. Zu den Komplikationen, vor denen man sich hüten muss, gehören Leberverfettung, Hypoglykämie, Insulinüberempfindlichkeit, Geschwüre des Jejunums, aufsteigende Infektionen der Gallenwege und Soffwechselstörungen.

RÉSUMÉ

L'auteur présente une discussion sur une pancréatectomie totale en insistant sur la prévention des complications post-opératoires. Il souligne l'effet de cette opération ainsi que celle de la duodénectomie pancréatique sur l'homme et sur animal expérimental (chien). Parmi les complications auxquelles il faut prendre garde sont: foie graisseux, hypoglycémie, sensibilité insuline, ulcère jéjunal infection montante des vaisseaux biliaires et troubles des fonctions métaboliques.

◆

At the time the doctrine of the circulation of the blood was finding acceptance, a countryman of Harvey, Richard Lower, was studying the heart and finding that it was a muscle and worked like one. Not long after Swammerdam had described red blood-cells, Sir John Floyer, of Staffordshire, began a scientific study of the pulse and invented an apparatus for timing the pulse; and shortly after Spallanzani demonstrated white blood-cells, Laënnec began listening to the heart with his stethoscope, and the whole era of physical diagnosis was in full swing.

—*Major*

Substitute for Stomach After Total Gastrectomy: Use of Right Half of Colon

KARL C. JONAS, M.D., F.A.C.S., F.I.C.S.
PHILADELPHIA, PENNSYLVANIA

GASTRIC cancer is responsible for more deaths in the United States than any other primary malignancy. Three per cent of all deaths, amounting to 23,000 annually, are attributed to this disease. Although the crux of the problem lies in earlier diagnosis, surgical efforts to improve these figures have been chiefly concerned with more radical resections. This has, of necessity, increased the frequency with which total gastrectomy is performed. Few will question the premise that total gastrectomy combined with splenectomy, omentectomy and wide resection of the lymphatic drainage basins of the stomach fulfils the criteria of an adequate resection for cancer more nearly than does subtotal gastrectomy. The surgeon's inability to replace the stomach *satisfactorily,* however, has seriously retarded the acceptance of total gastrectomy as the operation of choice for gastric cancer.

Many procedures have been suggested to compensate for the loss of the stomach. Some of these are as follows:

1. Esophagojejunostomy, end to side.[1]
2. Esophagoduodenostomy, end to end.[2]
3. Esophagojejunostomy, end to side, with duodenojejunostomy, end to side.[3]
4. Esophagojejunostomy, end to side, with jejunojejunostomy.[4]
5. Esophagojejunostomy, end to side, with "pantaloon" treatment of jejunum.[5]
6. Interposition of an isolated jejunal segment between the esophagus and the duodenum.[6]
7. Transposition of the right ileocolon between the esophagus and the duodenum.[7]
8. Esophagojejunostomy, end to end, with Roux en *Y* jejunojejunostomy.[9]
9. Insertion of an isolated segment of transverse colon, either isoperistaltic or antiperistaltic, between the esophagus and the duodenum.[10]

When so many methods have been suggested, it is apparent that no one procedure has been universally satisfactory. The chief disadvantages of esophagojejunostomy have been as follows:

1. Severe "dumping" syndrome.
2. Limited food capacity.
3. Steatorrhea, with inadequate fat metabolism.
4. Impaired protein metabolism, with negative nitrogen balance.
5. Weight loss, leading to cachexia and even death.
6. Anemia.

All of these unfavorable features except anemia appear to have a mechanical origin; either the new stomach has too small a lumen, or the food passes too rapidly through the small intestine to permit adequate digestion and absorption. The anemia following total gastrectomy, incidentally, can be satisfactorily managed by parenteral administration of the B-complex vitamins, including B-12 and iron.

Theoretical Considerations. — Most investigators are agreed that the viscus used to replace the stomach should be interposed

---

Read at the Twentieth Annual Congress of the United States and Canadian Sections, International College of Surgeons, Philadelphia, Sept. 12-15, 1955.

Submitted for publication Sept. 21, 1955.

between the esophagus and the duodenum, for several reasons. First, this will allow free regurgitation of bile and pancreatic juice into the new stomach, which is a distinct aid to digestion. Second, the food will not be swept out prematurely by lying distal to the duodenum. Third, this obviates a side opening with the distressing reflux esophagitis that accompanies it. In addition, the normal relations are preserved by having the new stomach lie between the esophagus and the duodenum. At present there are three technics that fulfil this criterion:

1. Transposition of the transverse colon, either isoperistaltic or antiperistaltic (State).
2. Isolated loop of jejunum (Longmire).
3. Transposition of the right ileocolon (Hunnicutt).

The capacity of the new stomach should also approximate that of the normal stomach, in addition to possessing some intrinsic absorptive power. The terminal portion of the ileum and the right half of the colon fulfil these requirements to a surprising degree. I therefore carried out the Hunnicutt operation in 4 cases, which comprise the basis of this report.

Preparation. — The patients were prepared as for resection of the colon—mechanical cleansing with oral Neomycin the day prior to the operation. No intragastric suction was used.

Operative Technic.—Through an upper abdominal midline incision, a wide resection of the entire stomach, including portions of the terminal segment of the esophagus and the proximal duodenum, the gastrohepatic, gastrocolic omenta and the spleen were carried out. The specimen was removed, after which the right half of the colon was freely mobilized to the midline. The mesentery was opened medial to the ileocolic and the right colic vessels, and these incisions extended to the bowel wall on the terminal portion of the ileum 20 cm. proximal to the cecum and to the midtransverse portion of the colon, with preservation of the ileocolic and right colic vessels. The ileum and the colon were both divided, and an anastomosis was carried out between the proximal end of the divided ileum and the distal end of the divided colon. The isolated right ileocolic segment was then rotated medially and counterclockwise and the proximal transverse colon united, end to end, to the duodenal stump. A third anastomosis between the esophagus and the ileum completed the transposition. All anastomoses were done with two rows of interrupted No. 35 stainless steel wire. An antibiotic solution containing 1,000,000 units of penicillin and 1 Gm. of streptomycin was instilled into the abdominal cavity, and the wound was closed with two rows of interrupted No. 30 stainless steel wire, without drainage. Appendectomy was done in two cases.

Results. — There were no operative deaths. There was 1 anastomotic leakage from the terminal portion of the esophagus, which defied several attempts at closure. A "gastrostomy" into the cecum, however, functioned sufficiently well to enable the patient to be ambulatory for seven months before succumbing to extensive recurrence of malignant disease in the epigastrium. In the other 3 cases the gastric substitute, although not ideal, functioned much better than any esophagojejunostomy I have observed. Food capacity was greater; the tendency to "dumping," though present early, did not persist, and postoperative loss of weight was not marked. One patient died thirteen months after the operation, of recurrent malignant disease producing obstructive jaundice, but for twelve of those thirteen months he was essentially free of digestive complaints. On discharge from the hospital, on the twefth postoperative day, he weighed 164 pounds (76.4 Kg.). Three months later he we[illegible] 177 [illegible]ds (

Kg.). The dextrose tolerance was normal, as were the serum protein level and the results of liver function studies.

The third patient entered the hospital weighing 110 pounds (49.9 Kg.), was discharged weighing 98 pounds (43.5 Kg.) and subsequently regained weight to 110 pounds. He succumbed one year later to extensive pulmonary metastases, but with no evidence of digestive disturbance.

The fourth patient is still living at the time of writing, eighteen months after the operation. Although he does not handle fats well, he is in positive nitrogen balance and essentially free of complaints.

COMMENT

The mechanical capacity of the terminal portion of the ileum and the right half of the colon is ideal for use as a stomach. In addition, its great absorptive powers seem to be valuable, as is demonstrated by the normal dextrose tolerance curve obtained. With present-day adjuncts, the colon can be adequately prepared, and the operation is not technically difficult. At first thought, mobilization and transposition of the right half of the colon seems a bit drastic. The actual maneuver of mobilization, however, requires but a few minutes. The reconstruction involves three anastomoses, the same number of suture lines as if one closed the duodenal stump, and carried out an esophagojejunostomy with a complementary enteroenterostomy. The total operating time varied from four to four and one-half hours in three cases. The patient in the fourth case had previously undergone a short-loop gastroenterostomy which had to be resected, adding another anastomosis. The operating time in this case was six hours. My opinion is that the primary healing and good immediate function of all anastomoses is due in large part to the use of fine-gauge interrupted stainless steel sutures. In no case was preoperative or postoperative intestinal intubation necessary.

The terminal portion of the ileum and the right half of the colon were used in 4 cases to replace the stomach after total gastrectomy. The initial results have been encouraging, and the author expresses the opinion that this technic deserves further trial.

ZUSAMMENFASSUNG

In vier Fällen totaler Magenresektion wurden der Endabschnitt des Ileums und die rechte Kolonhälfte als Magenersatz verwendet. Die anfänglichen Ergebnisse waren ermutigend, und die Verfasser glauben, dass weitere Versuche mit dieser Technik zu empfehlen sind.

RIASSUNTO

In quattro malati si usò la porzione terminale dell'ileo e la metà destra del colon per sostituire lo stomaco dopo una gastrectomia totale. I risultati immediati sono soddisfacenti e l'autore ritiene il metodo meritevole di applicazione.

RÉSUMÉ

La portion terminale de l'ileum et la partie droite du colon furent employées pour remplacer l'estomac après gastrectomie totale à 4 malades. Les résultats initiaux ont été encourageants et l'auteur est de l'opinion, que cette technique mérite d'être employée plus souvent.

REFERENCES

1. Conner, P. S.: Report of Case of Complete Resection of the Stomach, M. News, New York 45:578, 1884.
2. Schlatter, C.: Ueber Ernahrung und Verdauung nach vollstandiger Entkrnung des Magens; Oesophagoenterostomi, heim Menschen, Beitr. z klin chir. 19:757-776, 1897.
3. Horsley, J. S.: The Surgical Treatment of Cancer of the Stomach, Surg., Gynec. & Obst. 60: 486-494, 1935.
4. Graham, R. R.: A Technique for Total Gastrectomy, Surgery 8:257-264, 1940.

5. Engel, G. C.: The Creation of a Gastric Pouch Following Total Gastrectomy, Surgery 17: 512-523, 1945.

6. Longmire, W. P., and Beal, J. M.: Construction of a Substitute Gastric Reservoir Following Total Gastrectomy, Ann. Surg. 135:5, 1952.

7. Hunnicutt, A. J., and Kinsell, L. W.: Ileocolon Replacement of Stomach After Total Gastrectomy, Arch. Surg. 68:511-518, 1950.

8. Lee, W. M. Jr.: Transposition of a Colon Segment as Gastric Reservoir After Total Gastrectomy, Surg., Gynec. & Obst. 92:456, 1951.

9. Hunt, C. J.: Construction of Food Pouch from Segment of Jejunum as Substitute for Stomach in Total Gastrectomy, Arch. Surg. 64:601-608 1952. Roux, C.: Del la gastro-enterostomie, Rev. de gyn. et clier. Vol. 1 1897-67.

10. Barclay, T.; State, D., and Kelly, W. D.: Total Gastrectomy with Utilization of a Segment of Transverse Colon to Replace the Excised Stomach, Ann. Surg. 134: 1951.

11. Unpublished data.

IMPORTANT NOTICE TO ALL CONGRESS PARTICIPANTS

Those desiring their Congress presentations to appear later as articles in the **Journal of the International College of Surgeons**, please note:

1. **A full copy of the manuscript, together with all illustrations, legends, tabular matter and bibliographic references,** should be sent DIRECT to the Editorial Office, Journal of the International College of Surgeons, 1516 Lake Shore Drive, Chicago 10, Illinois. Manuscripts so submitted will be promptly acknowledged and, on acceptance by the Editorial Board, published as soon after the Congress as possible. **The Journal cannot be held responsible for loss, failure of acknowledgment, delay in publication or nonpublication of any manuscript, or any subsidiary material appertaining thereto, which has not been submitted through the official editorial channels.**

2. Manuscripts may be submitted in advance of the Congress if desired. *When this is done, they should be* **plainly marked with the name, place and date of the Congress concerned,** to guard against premature publication.

3. Manuscripts delivered in person to Congress officials or others **for press reportorial use only** should be sent by the recipient to the Public Relations Bureau.

These requests are made not only to safeguard the Journal from error but in the best interests of our contributors. To make sure of prompt acknowledgment and efficient handling of your Congress presentation, please send it DIRECT to its ultimate destination!

Adenomatous Polyp of Descending Portion of Duodenum Simulating Bleeding Peptic Ulcer

ARNOLD GOTTESMAN, M.D., F.I.C.S.

JACKSON HEIGHTS, NEW YORK

THE occurrence of adenomatous polypi in the duodenum is rare in comparison with its more common occurrence in the stomach and large bowel. Of the few cases in the literature for which there are pathologic reports, the presence of the lesions was suggested by routine roentgen examination or discovered during exploratory laparotomy. There are no characteristic clinical signs associated with polypoid adenomas occurring in this region, and in many instances the patient is entirely asymptomatic.

REPORT OF CASE

A 65-year-old white woman was first seen on Dec. 8, 1954, complaining that she had had "ulcer trouble" for thirty years. Formerly her distress had been characterized by spontaneous episodes of dull to severe midepigastric pain, occurring without any pertinent relation to food or activity and lasting one or two hours. The pain was neither increased nor lessened in severity or frequency of onset by food, alcohol, alkalis or antispasmodics. The patient had noted many years earlier that she could lessen the incidence of these episodes by using laxatives daily. About ten years prior to this consultation she had a sudden massive hematemesis, necessitating transfusion of 1,000 cc. of blood. She was maintained on an ulcer diet subsequently, but the epigastric pains continued to recur, though now characterized by nausea and vomiting one or two hours after meals. During the past two years there had been a decided increase in the frequency and severity of the pain, nausea and vomiting, with a time factor almost pathognomonic of peptic ulcer.

The past history revealed toxemia forty-two years earlier. Hysterectomy and oophorectomy had been performed two years later. Cystic mastitis had occurred five years prior to examination, and hypertensive heart disease with right hemiplegia three years later, with subsequent complete motor recovery. There was no pertinent history of food idiosyncrasies, alcoholic indiscretion, venereal disease, jaundice or parasitic infestation.

The results of general medical examination were entirely noncontributory. There was slight tenderness in the midepigastric region. The laboratory values were all within normal limits. Roentgen studies of the gastrointestinal tract revealed a well-circumscribed irregular filling defect in the second descending portion of the duodenum, proximal to the papilla of Vater. The roentgenologic impression, as stated by Dr. Mark Lynton on the basis of his observations, was that of benign tumor of the second part of the duodenum, probably a polyp, to be differentiated from scarring due to duodenal ulcer.

Laparotomy was done on Feb. 8, 1955. The second portion of the duodenum was opened longitudinally; the polyp was excised and the base ligated, and the duodenum was closed transversely.

Pathologic Report: The gross specimen (Fig. 2) consisted of a piece of hemorrhagic tissue measuring 1.3 by 1.2 by 0.7 cm. in its greatest dimensions. On cross section it revealed gray-white and hemorrhagic tissue. The entire specimen was submitted for histologic study.

Microscopic examination (Fig. 3) revealed polypoid formation covered by glandular epithelium. The underlying stroma showed hemorrhage. The pathologic diagnosis was benign polyp.

The interest of this case lies in the duration of clinical symptoms. The patient dated her history to thirty years prior to the operation, when she noted dull, "achy" pain in the epigastrium. This lasted for

---

From the Lexington Hospital, New York.
Submitted for publication June 20, 1954.

hours, often awakening her at night. There was no history of food allergies, no relief of symptoms from taking food or medication, no periodicity and no seasonal factor. Apparently relief was obtained by purging.

This history is noteworthy in that it suggests peptic ulcer, yet reveals none of the periodicity, favorable response to medication, etc., that one would expect. According to the patient's own account, she had lived with these symptoms for thirty years. Ten years prior to consulting me there had been a severe hematemesis, with melena of such severity that multiple transfusions were necessary. In addition to the suggestive history, this episode of massive bleeding would suggest bleeding peptic ulcer, malignant tumor, diverticula or varicosities; nevertheless, no surgical intervention had been performed. After this episode, nausea and vomiting occurred in a more or less chronic fashion. The vomitus contained undigested food and was preceded by cramplike abdominal pain. Within the past two years, radiation of the pain and increase in its frequency, together with nausea and vomiting, caused the patient to seek surgical relief. The presence of a benign polyp in a 65-year-old woman whose symptoms were highly suggestive of a bleeding peptic ulcer is the basis for this report.

COMMENT

Benign polyps of the duodenum occur infrequently and are much less common than are similar lesions in the remainder of the gastrointestinal tract. The nonmalignant neoplasms that occur in this region include polyps, fibromyomas, adenomas, endotheliomas, hemangiomas and fibromas. There are no clinical signs or symptoms that are characteristic of these tumors; in many instances the patient is entirely asymptomatic, the tumor being discovered on routine roentgen examination or during a laparotomy for some other condition. There may be symptoms sug-

Fig. 1.—Roentgenograms of 65-year-old woman with an adenomato f th

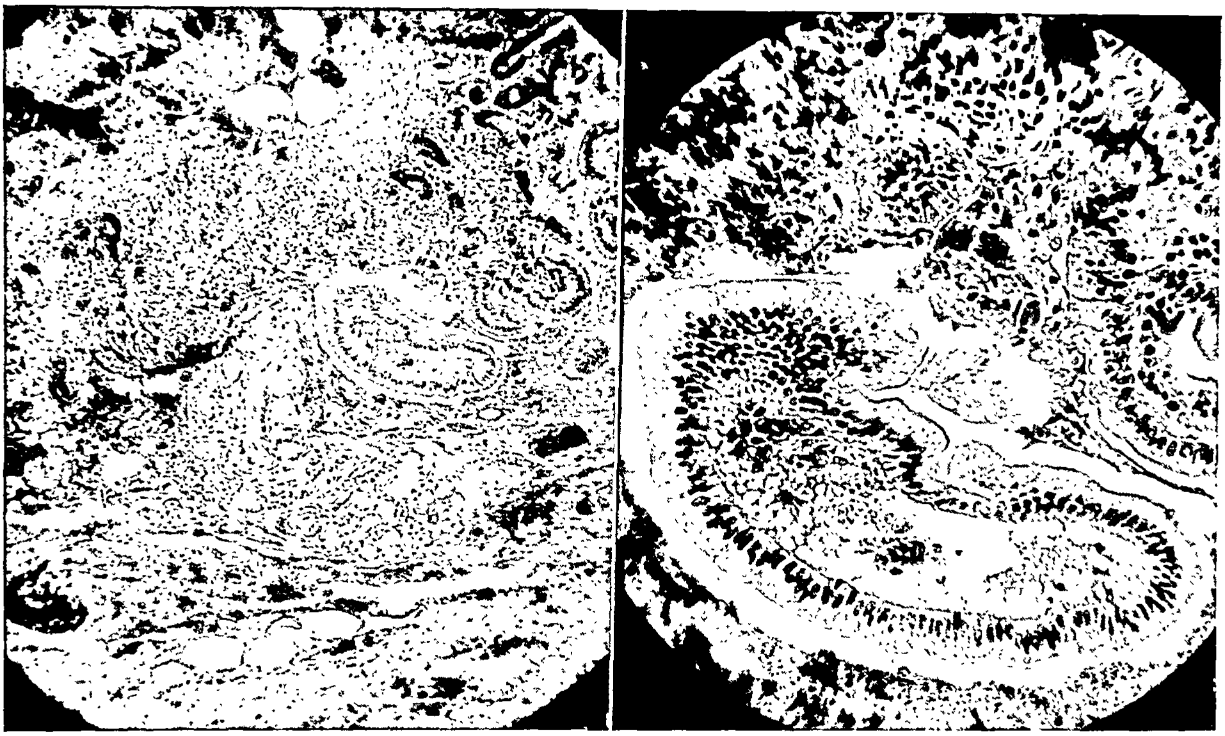


Fig. 3.—Low power (*left*) and high power (*right*) photomicrographs, revealing polypoid formation covered with glandular epithelium. Underlying stroma shows hemorrhage.

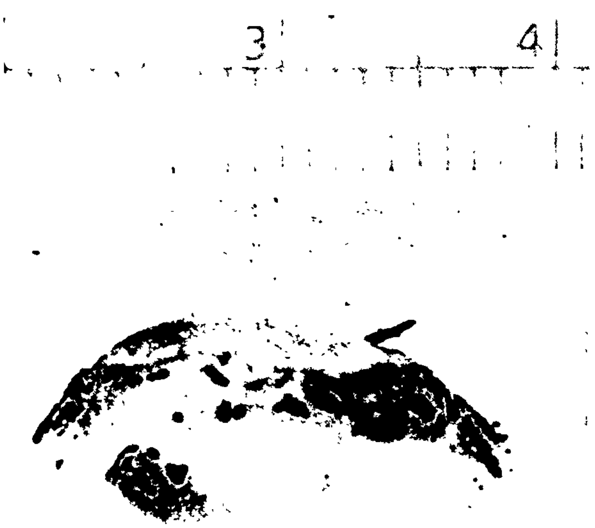


Fig. 2.—Polyp removed from duodenum. Gross specimen, consisting of a piece of hemorrhagic tissue measuring 1.3 by 1.2 by 7 cm. in its greatest dimensions. The entire specimen was submitted for histologic examination.

gestive of peptic ulcer. In some instances, bleeding from the gastrointestinal tract is the sole manifestation. Obstruction may occur, particularly if there is intussusception. Vomiting and diarrhea are occasionally present. If the tumor is situated in such a position as to cause obstruction of the ampulla of Vater, jaundice and/or the manifestations associated with obstruction of the pancreatic duct ensue.

SUMMARY

A case of benign polyp of the descending portion of the duodenum, simulating bleeding peptic ulcer, is reported. The condition was diagnosed preoperatively by roentgen examination. The patient's symptoms were relieved completely by removal of the polyp.

ZUSAMMENFASSUNG

Es wird über einen Fall von gutartigem Polyp im absteigenden Zwölffingerdarm

berichtet, der dem Krankheitsbild eines blutenden Geschwürs ähnelte. Die Erkrankung wurde vor der Operation röntgenologisch erkannt. Die Krankheitserscheinungen wurden durch Entfernung des Polypen völlig behoben.

RÉSUMÉ

Le cas d'un polype bénigne de la portion déscendante du duodénum est reporté, qui simula un ulcère peptique, saignant. La diagnose était faite par l'examen radiographique avant l'opération. Le malade fut complètement guéri par l'excision du polype.

RIASSUNTO

Viene riferito un caso di polipo benigno della seconda porzione duodenale simulante un'ulcera duodenale sanguinante. Fu possibile uná diagnosi preoperatoria radiologica e si ottenne la guarigione completa mediante la asportazione del polipo.

RESUMEN

Se comunica un caso de un polipo beigno de la porción descendente del duodeno que simulaba una úlcera péptica sangrante. Se hizo el diagnóstico preoperatorio por medio de los exámenes roentgenográficos. Los síntomas desaparecieron completamente después de la extirpación del polipo.

BIBLIOGRAPHY

Bauss, A.: Benign Tumor, Der Chirurg, zeitschrift. f. allegebiete der operative Med. 21:558, 1950.

Campbell, R. E., and Young, J. M.: Leiomyoma of the Duodenum, Am. J. Surg. 88:618, 1954.

Colo, D. R.: Fibromyoma of the Duodenum, Arch. Surg. 66:392, 1953.

Cressman, R. D.: Leiomyoma of the Stomach and Duodenum, Gastroenterol. 26:239, 1954.

Hoffman, W. L., and Pack, B. T.: Benign Tumors of the Duodenum, Am. J. Surg. 70:394, 1945.

Kirkland, W. B., and Bayer, R. A.: Multiple Lipoma, Gastroenterol. 17:142, 1951.

Linali, O.: Benign Tumors, Atti acced. fisiocritsioma 19:159, 1951.

Lenart, E.: Frequent Simultaneous Occurrence of Benign Tumors of the Stomach and Duodenum, Gastroenterol. 72:60, 1947.

Noon, C.: Adenoma, Brit. J. Surg. 39:87, 1951.

Sinkler, W. H., and Brewer, T. H.: Leiomyoma, J. Internat. Coll. Surgeons 17:449, 1952.

Straus, F. H., and O'Kane, C. R.: Leiomyoma of the Duodenum: Case Report and Review of the Literature, Surgery 32:869, 1952.

Woodward, B.: Benign Tumors of the Duodenum: Report of 7 Cases, West. J. Surg., Obst. & Gynec. 62:513, 1954.

In the light of the recent tobacco-pulmonary carcinoma controversy it is interesting to discover that a book was once published for the sole purpose of extolling the "vile weed" as a medicine! The author was the learned Dr. Everard of England, and the book appeared in 1659. *Its title? "Panacea, or a Universal Medicine,* Being a Discovery of the Wonderful Virtues of Tobacco."

Appendectomy Versus Hemicolectomy for the Colonic Type of Carcinoma of the Appendix

WILLARD J. KISER, M.D., F.I.C.S., LAUREL G. CASE, M.D.,
LEO P. CAWLEY, M.D.,* AND BERT E. STOFER, M.D.**
WICHITA, KANSAS

SCATTERED reports of carcinoma of the appendix can be found in the literature since 1882, when the first undoubted primary carcinoma was reported by Beger.[1] Recently various histologic types of appendiceal malignant lesions have been defined.[2] Carcinoma, mucocele and colonic types have been separately identified. The last-mentioned type is the least common.[3]

The clinical features of carcinoma of the appendix were well summarized by Norment[4] in 1932. A study of the literature shows that several different procedures have been used in treatment of the colonic type of carcinoma of the appendix. It is the purpose of this paper to tabulate the acceptable cases, up to the time of writing, with reference to the surgical treatment; to add 1 case, and to evaluate hemicolectomy as the procedure of choice in this disease.

REPORT OF CASE

O. M., a 51-year-old white woman, complained of pain under the right costal margin and in the right flank for three weeks before her admission to the hospital. The pain moved to the right side of the abdomen and became constant. It was not aggravated by food or exercise. There was no history of jaundice or fat intolerance. There was no nausea, vomiting, constipation or diarrhea. During the past few years the patient had had several severe attacks of backache and muscular spasm associated with an arthritic spine. There was no family history of cancer.

Physical examination showed the patient to be in acute distress. Moderate tenderness and rigidity were elicited in the right upper and lower abdominal quadrants. No masses were palpable. Laboratory examination on admission showed 3,790,000 red blood cells per cubic millimeter, with 68.6 per cent hemoglobin, and 7,450 white blood cells per cubic millimeter, with 63 per cent polymorphonuclear leukocytes. The urine was normal except for a trace of albumin and 20 to 25 white cells per high power field. Roentgen study of the colon revealed moderate irritability of the descending and sigmoid portions of the colon, without evidence of any intrinsic lesion. Six days after admission an appendectomy was performed.

The specimen received in the laboratory was an appendix measuring 9 by 0.5 cm. The serosal surface was smooth. The lumen was obliterated in the distal third of the organ. Fecal material filled the remainder of the lumen. The accompanying photomicrograph shows a section taken from the tip of the appendix. The tumor exhibited the pattern of an adenocarcinoma of moderate malignancy. There was considerable fibrous tissue proliferation. The tumor completely replaced the mucosa and invaded the muscle, but did not extend to the serosal surface.

Ten days after the pathologic report of malignant tumor had been returned, a right hemicolectomy was done. No evidence of regional node involvement or peritoneal spread of the tumor could be discovered. The patient was discharged from the hospital in good condition. A checkup on Oct. 10, 1955, showed her well and free of disease, two years and seven months after hemicolectomy.

The specimen from the second operation was a segment of colon and ileum. The colonic portion measured 20 cm. in length, the ileal

---

*Resident in Pathology, Wesley Hospital, Wichita.

**Pathologist, Wesley Hospital, Wichita.

From the Wichita Foundation of Medical Research.
Submitted for publication Dec. 24, 1956.

portion 15 cm. The serosa over both colon and ileum was smooth; the wall was of normal thickness, and the mucosa was uninvolved by tumor. The attached mesentery contained several palpable nodes, the largest 1 cm. in diameter. The site of the appendectomy was visualized and appeared to be in the normal postoperative state. The specimen was cleared after the manner of Berlin and Brines.[5] By this technic the lymph nodes were easily visualized. Twenty-nine nodes, measuring from 1 to 6 mm. in maximum diameter after fixation, were obtained for section. Microscopic examination failed to reveal any recognizable metastases.

Material. — The literature on colonic type of carcinoma of the appendix has been documented by Lesnick and Miller and was included in their report of 1949.[6a] Starting with this series, we have reviewed the literature and accumulated a total of 42 cases, including the one here reported.[7]

All carcinoid tumors and all mucus-producing tumors that resulted in mucoceles have been excluded. An occasional colonic carcinoma included in the series has produced mucus to a slight degree, but none has been productive of excessive mucus. When there was any question of cecal origin, the case was excluded.

Classification. — The cases so accumulated were divided into two major groups. Group I included those in which treatment consisted of appendectomy alone. Group II included those in which appendectomy was followed very shortly by hemicolectomy, with one exception—a case in which the lesion was treated by primary hemicolectomy.

Each group was subdivided into Stages 1 through 4 on the basis of the tumor's extent as judged by both gross and microscopic examination. Cases in which the tumor was limited to the mucosa were classified as Stage 1; cases in which the tumor did not extend beyond the serosa of the appendix, as Stage 2, and cases in which the cecum, the regional nodes or the abdominal peritoneum was involved, as Stage 3. All cases of perforated appendixes with tumors were placed in the last-mentioned group. All cases in which the tumor extended beyond the limits mentioned for Stage 3 were classified as Stage 4.

Section from appendix, showing extent of involvement by colonic type of carcinoma.

The cases so selected and classified are presented in the accompanying table. Seven of the 42 cases were not followed. In Cases 2, 16 and 25 the diagnosis was established by autopsy, operation having been contraindicated owing to the advanced stage of the disease when the patient was first seen. In Case 35 ileostomy was performed, further procedure being prevented by the appendeceal abscess and the advanced age of the patient. These have been excluded from the table. The remaining 31 cases form the basis of this report. Two (Cases 14 and 39) have been brought up to date by personal communication with the authors. Although the series is not large, we have been unable to find any other acceptable cases in the literature.

COMMENT

Study of the table shows that in 13 out of 14 cases in which the tumor remains limited to the mucosa or the wall (Stage 1 or 2) appendectomy was adequate. Contrary to previously expressed opinion,[6] appendectomy will not always prevent recurrence, as was demonstrated by Case 1. When only the appendix is available for study, absence of lymph node metastases cannot be assured. Therefore, as a factor of safety, appendectomy should be reserved for cases in which the tumor is limited to the mucosa (Stage 1) since in cases of tumor in the wall (Stage 2) there is a 16.7 per cent recurrence rate for appendectomy alone.

Reference to the table also shows clearly the advantage of hemicolectomy as opposed to appendectomy when the tumor has progressed to the serosal coat or beyond (Stages 3 and 4). There are 14 cases of Stage 3 and Stage 4 tumors in this series. In half of these, appendectomy alone was performed. In the other half, appendectomy was followed almost immediately by hemicolectomy. In Case 4 primary hemicolectomy was performed. Of the patients with tumors in Stages 3 and 4 who were appendectomized, 1 is dead of disease

*Comparative Results of Appendectomy and Hemicolectomy**

Appendectomy

Stage 1	7 32	12	22	6		21 20	38
Stage 2		33	(1)			17 5	19 28
Stage 3					[14]		
Stage 4	30 40 (13) 34	37		36			
Years followed	1	2	3	4	5	5 to 10	Over 10

Hemicolectomy

Stage 1					39		
Stage 2		42	3				
Stage 3		8 41		18			24
Stage 4		4† [24]	31				
Years followed	1	2	3	4	5	5 to 10	Over 10

*Numbers refer to cases as listed in references
Not followed: 9, 10, 11, 15, 26, 27, 29
Laparotomy only: 35
Autopsy diagnosis: 2, 16, 25
[ ] = Dead with disease
† = Primary hemicolectomy
( ) = Living with disease
—— = Postoperative death

at five years, 1 is living with disease, 4 are free of the disease, the longest of which is four years. There was 1 postoperative death. Of the hemicolectomized patients with Stage 3 and 4 tumors, 1 is dead at two years, 6 are living and well two to fourteen and one-half years. The average time free of disease for appendectomized patients is two years; for hemicolectomized patients, four and six-tenths years.

In the 6 cases in which the tumors had gone beyond the mucosa (Stage 2), and were treated by appendectomy alone, 1 was terminal at three years. Therefore, on the basis of current information, the surgeon who is content to perform only appendectomy and not follow it with hemicolectomy in the presence of Stage 2 tumors is taking a 17 per cent chance of recurrence.

SUMMARY

Forty-two cases of the colonic type of carcinoma of the appendix, collected from the world's literature, are reviewed and tabulated. All cases which were not operated and followed are discarded. One additional case is reported, bringing the total number of cases suitable for review to 31. This series is grouped into those treated by appendectomy alone and those which had hemicolectomy. From the data obtained it appears that for all cases of colonic type of carcinoma extending beyond the mucosa, the treatment of choice is hemicolectomy.

RÉSUMÉ

Quarante deux cas du type colonique de cancer de l'appendice recueillis de la littérature du monde entier sont revisés et tablés. Touts les cas qui n'étaient pas opérés et suivis, furent exclus. Un cas additionel set reporté, ce qui relève le nombre total des cas, aptes pour une révision, a 31. Cette série ets partagée en ceux, qui étaient traités seulement par appendectomie et ceux, qui avaient une hémicolectomie.

Par les dates obtenues il parait, que pour les cas du type colonique d'un carcinome, qui s'etend au délà de la muqueus e, la hémicolectomie est le traitement de choix.

SUMARIO

Quarenta e dois casos de carcinoma do tipo colônico do appendice colecionados da literatura mundial são revistos.

Todos os casos que não foram operados ou não foram seguidos, foram desprezados.

Um caso adicional é referido, elevandose a 31, o número total de casos revistos. Esta série sómente é dividida entre os tratados por apendicectomia e aqueles que sofreram hemicolectomia. Esta análise sugere que os casos de carcinoma do tipo colonico extendendo além da mucosa, o tratamento de escolha é hemicolectomia.

ZUSAMMENFASSUNG

Zweiundvierzig Fälle von Blinddarmkrebs vom Typ des Kolonkarzinoms, die aus der Weltliteratur gesammelt wurden, werden untersucht und in tabellarischer Form zusammengestellt. Alle nicht operierten und nicht nachuntersuchten Fälle werden ausgeschieden. Nach Hinzufügung eines eigenen Falles der Verfasser beläuft sich die Gesamtzahl der für ein Studium geeignet erscheinenden Fälle auf 31. Diese Krankheitsgruppe wird eingeteilt in Fälle, die nur mit Resektion des Blinddarms und in solche, die mit Hemikolektomie behandelt wurden. Die Untersuchung der vorliegenden Angaben ergibt, dass für alle Fälle vom Typ des Kolonkarzinoms, wo sich der Prozess über die Schleimhaut hinaus erstreckt, die Hemikolektomie als die Behandlung der Wahl anzusehen ist.

REFERENCES

1. Beger, A.: Ein Fall von Krebs des Wormfortsatzes, Klin. Wchnschr. 19:616, 1882.
2. Uihlein, A., and McDonald, J. R.: Primary Carcinoma of the Appendix Resembling Carcinoma of the Colon, Surg., Gynec. & Obst. 76:711, 1943.
3. Hillsabeck, J. R.: Carcinoma of the Appendix: Analysis of a Series of Cases, Proc. Staff Meet. Mayo Clin. 28:11, 1953.
4. Norment, W. B.: Tumors of the Appendix, Surg., Gynec. & Obst. 55:590, 1932.
5. Berlin, R. B., and Brines, O. A.: Detection of Lymph Node Involvement in Cancer, Am. J. Clin. Path. 21:332, 1951.
6. (a) Lesnick, G., and Miller, D.: Cancer 2:18, 1949 (Cases 2, 3 and 4). (b) Uihlein, A., and McDonald, J. R.: Surg., Gynec. & Obst. 78:711, 1943 (Cases 5, 6 and 7). (c) Young, E. L., and Wyman, S.: New England J. Med. 227:205, 1942 (Case 8). (d) Chomet, B.: Am. J. Clin. Path. 14: 447, 1944 (Cases 9, 10 and 11). (e) Frauenthal, M., and Grausman, R. I.: Am. J. Surg. 19:118, 1933 (Case 12). (f) Schuldt, F. C.: Minnesota Med. 23:79, 1940 (Case 13). (g) Rosenblatt, M. S., and Robertson, T. S.: Northwest. Med. 35:103, 1936 (Case 14). (h) Marks, E. S., and Whitaker, H. W.: Surgery 27:720, 1950 (Case 15). (i) Pangaro, J. A.; Lacovone, R., and Buitron, P.: Prensa med. argent. 38:3254, 1951 (Case 16). (j) Hilsabeck, J. R.; Judd, E. S., and Woolner, L. B.: Surg. Clin. North America 31:995, 1951 (Cases 18, 19, 20, 21, 22, 23, 24 and 25). (k) Hughes, J. H.: Brit. J. Surg. 39:282, 1952 (Case 26). (l) Smith, H. O.: Canadian M. J. 65:280, 1951 (Case 27). (m) Sillery, R. S.: J.A.M.A. 150:189, 1952 (Cases 28 and 29). (n) Lawton, S. F., and Ehrlich, R. W.: J.A.M.A. 150:189, 1952 (Cases 30, 31 and 32). (o) French, W. E.: Am. Surgeon 18:3133, 1952 (Case 33). (p) Jensen, E. I.: Ugesklager 114:1012, 1952 (Cases 34 and 35). (q) Clark, R. G., and Simonds, J. P.: Am. J. Digest. Des. 20:47, 1953 (Cases 36 and 37). (r) Hilsabeck, J. R.: Proc. Staff Meet. Mayo Clinic 38:11, 1953 (Case 38). (s) Fleming, J. M.: Am. J. Surg. 86:188, 1953 (Case 39). (t) Gerber, A; Mackles, A., and Raab, A. B.: New England J. Med. 250:505, 1954 (Case 40). (u) Knepper, P. A.; Riddell, R. V., and Carpenter, G. T.: Arch. Surg. 68:519, 1954 (Case 41). (v) Kiser, W. J.; Case, L. G.; Cawley, L. P., and Stofer, B. E.: J. Internat. Coll. Surgeons 25 (this issue), 1956 (Case 42).

◆

Important Announcement For 1957!

The Tenth International Scientific Congress of the International College of Surgeons will be held at the invitation of the Mexican Government and under the Honorary Presidency of His Excellency, Don Adolfo Ruiz Cortinez, President of the Republic of Mexico, February 24-28 inclusive, 1957, at University City, Mexico, D. F. The Grand Opening Ceremony will take place at the Palace of Fine Arts, and the scientific sessions in the University buildings.

For further details address:
International College of Surgeons
1516 Lake Shore Drive
Chicago 10, Illinois

Attention: Secretary, Mexican Congress

Genitourinary Surgery

Induced Hydronephrosis to Expedite the Removal of Incarcerated Small Renal Calculi

JOHN W. DORSEY, M.D., F.A.C.S., F.I.C.S.
LONG BEACH, CALIFORNIA

THE *small renal* calculus incarcerated in a minor calyx with an elongated narrow infundibulum has always presented a difficult problem in surgical management. The constricted infundibulum prevents digital palpation through a pyelotomy incision, and instrumental palpation of the calculus through such an exposure is extremely difficult and unsatisfactory. The small size of the calculus militates against the success of multiple needling. Roentgenographic control at operation is time-consuming and fraught with error. In the past it has been necessary to utilize the extension pyelotomy of Marion, or even partial bisection of the kidney, in order to adequately explore the minor calyces adequately. In the management of small, relatively asymptomatic renal calculi a program of nonintervention is desirable, since one may hope that the calculus will become dislodged and assume a position in the ureter from which it can be removed without undue difficulty.

The principle of "induced hydronephrosis" has evolved from the observation that, shortly after obstruction of the ureter by a calculus, there developed a definite hydronephrosis, which, if relieved within a short time, produced no evident renal destruction. It was considered justifiable to apply this alteration of renal hydrodynamics in reverse, and by ureteral blockade to produce a hydronephrotic change. This hydronephrosis would either release the small calculus incarcerated in the minor calyx or render exploration of the calyceal system a relatively simple, nontraumatizing procedure.

The double-lumen McCarthy balloon catheter was used in the first 3 cases to produce the ureteral blockade. The mechanical difficulties attending the use of this catheter were such that C. R. Bard, Inc., consented to manufacture the catheter illustrated in Figure 1. This is an 8-F, double-lumen, spiral-tip balloon catheter. The butt is split to permit easy inflation of the balloon or the introduction of a contrast medium into the renal pelvis. The balloon is located at the 7 cm. level to facilitate introduction of the catheter past the lower ureteral segment.

The solution used to inflate the balloon is a mixture of 20 per cent skiodan and indigo carmine. The use of contrast medium permits accurate roentgen determination of the level and completeness of ureteral blockade. Indigo carmine is added to obtain evidence of any leakage in the system inflating the balloon.

For retrograde studies a 2.5 per cent solution of Neomycin sulphate in skiodan was employed, as suggested by Roth, Hess and Kaminsky.

Surgical Technic.—In the presence of

From the Department of Surgery, Division of Urology, University of California School of Medicine at Los Angeles.

Read at the Twentieth Annual Congress of the United States and Canadian Sections, International College of Surgeons, Philadelphia, Sept. 12-15, 1955.

Submitted for publication Sept. 14, 1955.

infection the patient is given the most appropriate antibiotic or chemotherapeutic agent prior to and throughout the immediate postoperative course. A ureteral meatotomy is performed if deemed necessary, and the ureteral balloon catheter is advanced to the level of the renal pelvis. The balloon is positioned 3 to 5 cm. below the ureteropelvic junction, at which point it is inflated with 1 to 2 cc. of contrast medium. A scout film and a retrograde urogram are taken to determine the position of the calculus and the balloon with respect to the renal pelvis. Both segments of the ureteral catheter are then plugged.

A recheck scout film and a retrograde urogram are taken in one hour to determine the position of the calculus and the degree of hydronephrosis produced. This procedure is repeated at hourly intervals until the degree of hydronephrotic change necessary to permit surgical exploration has been attained (usually one to two hours). When this stage has been reached, the catheter is left in position with both segments occluded and the patient is taken to the operating room. The kidney is exposed, a pyelotomy incision is made and the calculus removed instrumentally; or, if it is adherent to the calyceal mucosa as in Case 2, it is palpated digitally, fixed in position and removed through a small nephrotomy incision. The obstructing balloon is decompressed after removal of the calculus, and the ureteral catheter is removed.

In all cases the ureteropelvic junction is calibrated, and where obstruction is encountered the necessary measures are taken to correct it. Nephropexy, nephrostomy drainage and splinting ureteral catheters are utilized where indicated. The postoperative care is the same as that given after an ordinary pyelolithotomy or nephrolithotomy.

Six cases are reported in abstract.

REPORT OF CASES

CASE 1.—A 30-year-old man complained of intermittent right renal colic with associated gross hematuria of six years' duration, due to a small right renal calculus. A scout film (Fig. 2*A*) confirmed this diagnosis, and a right oblique retrograde urogram (Fig. 2*B*) revealed the plaquelike nature of the small calculus incarcerated in an inferior minor calyx with an elongated, narrow infundibulum. A double-lumen balloon catheter was advanced to the right renal pelvis and then withdrawn 6 cm. to a position in the proximal portion of the ureter, and the balloon was inflated with 2 cc. of water. A scout film (Fig. 2*C*) showed the calculus displaced to a position in the renal pelvis. An attempt to lead the calculus into the ureter by altering the position of the patient met with failure, undoubtedly because of the plaquelike nature of the calculus. The balloon was then deflated and removed in the hope that returning peristalsis would carry the calculus into the ureter, but instead the calculus resumed its original position in the

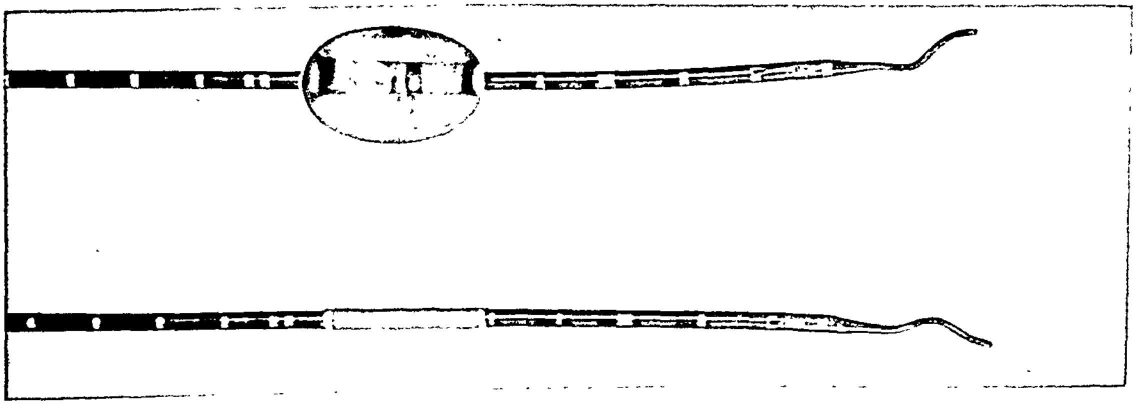


Fig. 1.—F-8, double-lumen spiral-tip balloon catheter created by C. R. Bard, Inc.

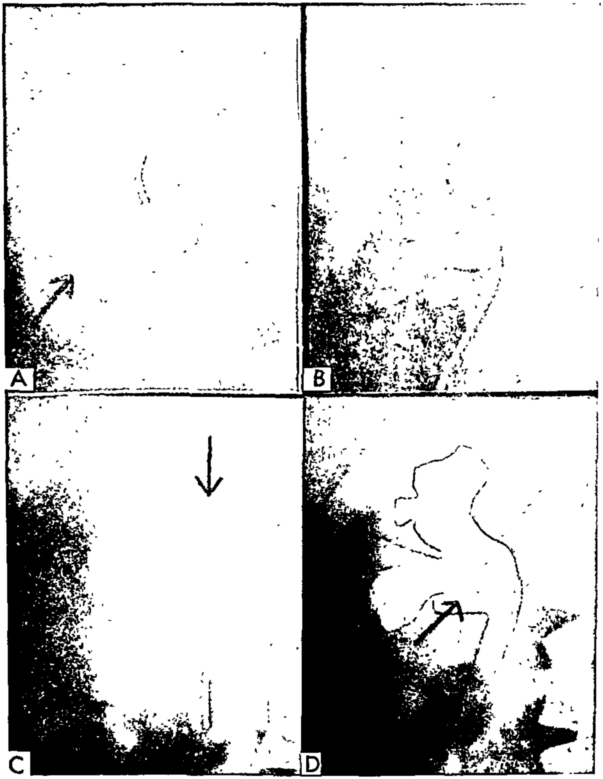


Fig. 2 (Case 1).—*A*, scout film showing square calculus and balloon in pelvis. *B*, right oblique retrograde urogram shows plaquelike calculus. *C*, dislocation of calculus to renal pelvis. *D*, induced hydronephrosis with calculus free in pelvis.

inferior minor calyx. The procedure was repeated one week later, and the retrograde urogram (Fig. 2*D*) shows the degree of hydronephrosis attained with the calculus again displaced to a position in the renal pelvis. The calculus was quickly and easily removed through a small posterior pyelotomy incision.

Case 2.—A 49-year-old woman complained of localized intermittent pain in the right flank of five months' duration. The renal colic was not initiated by posture but was alleviated by assuming the dorsal recumbent position. Excretory urographic study revealed a small calculus lodged in an inferior minor calyx of a ptotic right kidney. There was no evidence of parenchymal damage or obstructive uropathic disease. On the basis of the small size of the calculus and the paucity of symptoms the patient was advised to return in one year for reexamination. When next seen she complained of a progressive increase in the severity, frequency and duration of the attacks of pain in the right flank. Retrograde urograms revealed a slight increase in the size of the previously noted calculus, slight pyelectasis and complete retention of the contrast medium on the fifteen-minute delayed upright film. The scout film (Fig. 3*A*) showed the balloon within the renal pelvis and a small shadow of calcific density overlying the lower pole of the right kidney. The preoperative retrograde urogram (Fig. 3*B*) showed an elongated narrow infundibulum leading to the inferior minor calyx containing the small calculus. Figure 3*C* shows the balloon repositioned to a more favorable location to accomplish the ureteral blockade. Figure 3*D*, taken two hours later, showed the advanced hydronephrotic change, with dilation of the infundibulum leading to the inferior minor calyx containing the calculus. A digital examination through a pyelotomy incision quickly located the calculus in the dilated inferior calyx and fixed it in position. Through a small nephrotomy incision of the stab type the calculus was removed and the calyx curetted. A nephropexy was performed after a nephrostomy tube and two splinting ureteral catheters had been properly placed.

CASE 3.—A 33-year-old woman had been repeatedly admitted to various Army hospitals in the past six years because of chills, fever, and left renal colic of increasing frequency and severity. Preliminary study revealed multiple small left renal calculi, as well as pyuria emanating from the left kidney. The scout film (Fig. 4*A*) showed a cluster of small shadows of calcific density overlying the upper pole, and a tiny plaquelike shadow over the lower pole of the left kidney. The retrograde urogram (Fig. 4*B*) showed a cluster of small calculi located in a superior minor calyx with a constricted infundibulum, while the tiny plaquelike calculus was located in the fornix of an inferior minor calyx. The balloon, after being properly positioned, was inflated with 1 cc. of contrast medium. A recheck retrograde urogram after an hour and a half (Fig. 4*C*) showed some dilation, but definite reflux of the medium around the balloon, indicative of inadequate filling and incomplete blockade. The balloon was redistended with 1.5 cc. of contrast medium. A retrograde urogram (Fig. 4*D*), taken forty-five minutes later, showed excellent dilation of the calyceal system and complete ureteral blockade. Through a transverse pyelotomy incision the small plaquelike calculus measuring 3 by 2 by 1 mm. was removed from the inferior calyx with a Randall stone forceps. The cluster of calculi in the upper pole was quite superficial, so the calyx was resected. The infundibulum appeared to be completely occluded. A nephropexy was performed. A retrograde urogram taken two months after the operation revealed no distortion of the calyceal system or recurrent calculus formation, and the pyuria has disappeared.

CASE 4.—A 47-year-old woman complained of four attacks of pain in the right flank, chills and fever in the four months prior to admission. Excretory urograms taken by the referring physician showed a calculus 1 by 0.5 cm. incarcerated in an inferior minor calyx of the right kidney. Excellent dilation of the calyceal system was accomplished in one hour and forty-five minutes. Only the posterior surface of the lower pole of the kidney and renal pelvis was mobilized. A pyelotomy incision revealed the calculus lying free in the renal pelvis. This case well illustrates the displacement of a calculus incarcerated in a minor calyx to a position in the renal pelvis, where it can be removed with a minimal amount of renal trauma.

CASE 5.—A 48-year-old man had had recurrent pain in the right flank, chills, fever, occasional gross hematuria and persistent pyuria due to Aerobacter aerogenes. He had undergone a right ureterolithotomy sixteen years earlier for removal of a calculus impacted in the right ureter at the ureteropelvic junction. Retrograde studies revealed a small intrarenal pelvis and a calculus 1 cm. in diameter, incarcerated in an inferior minor calyx with an elongated infundibulum. The patient refused surgical removal of the stone for two years, and then, because of a progressive increase in his symptoms, asked for it. The balloon was placed about 4 cm. below the ureteropelvic junction. A retrograde urogram taken one hour later showed moderate dilation of the calyceal system. Partial mobilization of the lower pole of the kidney, the renal pelvis and the proximal portion of the ureter was accomplished by sharp dissection, owing to the presence of extensive dense adhesions. A posterior pyelotomy incision was made and the calculus palpated digitally, fixed in position and removed through a small nephrotomy incision. The calculus was pyramidal, measuring 1 cm. across the base.

CASE 6.—A 48-year-old woman complained of recurrent attacks of pain in the left flank, fever and cystitis of eight years' duration. Preoperative urograms revealed a calculus almost filling the superior major calyx and a

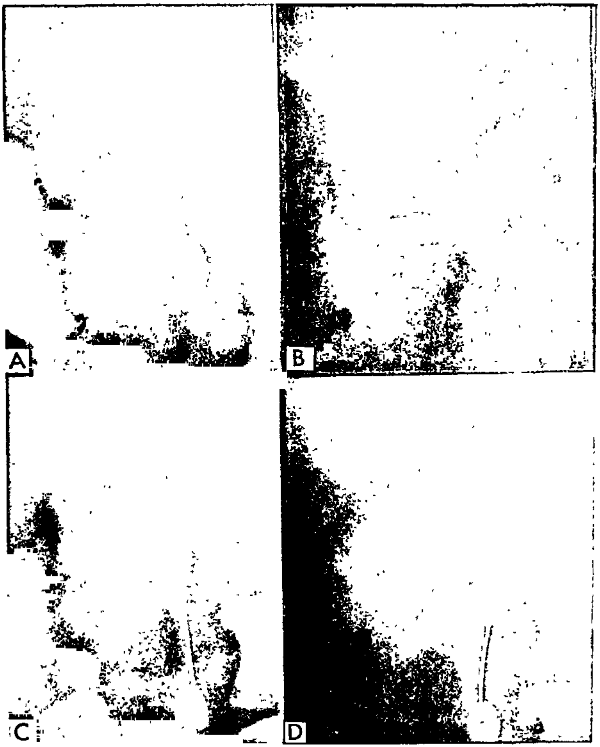


Fig. 3 (Case 2).—*A*, scout film showing small calculus and balloon. *B*, retrograde film shows calculus incarcerated in an inferior minor calyx with an elongated narrow infundibulum. *C*, retrograde film with balloon repositioned. *D*, induced hydronephrosis with calculus retained in dilated inferior calyx.

second, smaller calculus incarcerated in a middle minor calyx with a narrow infundibulum. The pelvis was intrarenal. The balloon was positioned 4 cm. distal to the ureteropelvic junction and distended with 1.5 cc. of contrast medium. Satisfactory dilation of the calyceal system was achieved in one and one-half hours. The large calculus was easily extracted from the superior calyx through a transverse pyelotomy incision. Digital and instrumental palpation failed to reach the small calculus. During complete mobilization of the kidney preparatory to incising the renal parenchyma, the small calculus fell out of the pyelotomy incision into the wound. Postoperative studies reveal an excellent calyceal system, and the urine is sterile.

COMMENT

Appropriate antibiotic therapy and chemotherapy should be utilized throughout the preoperative and postoperative

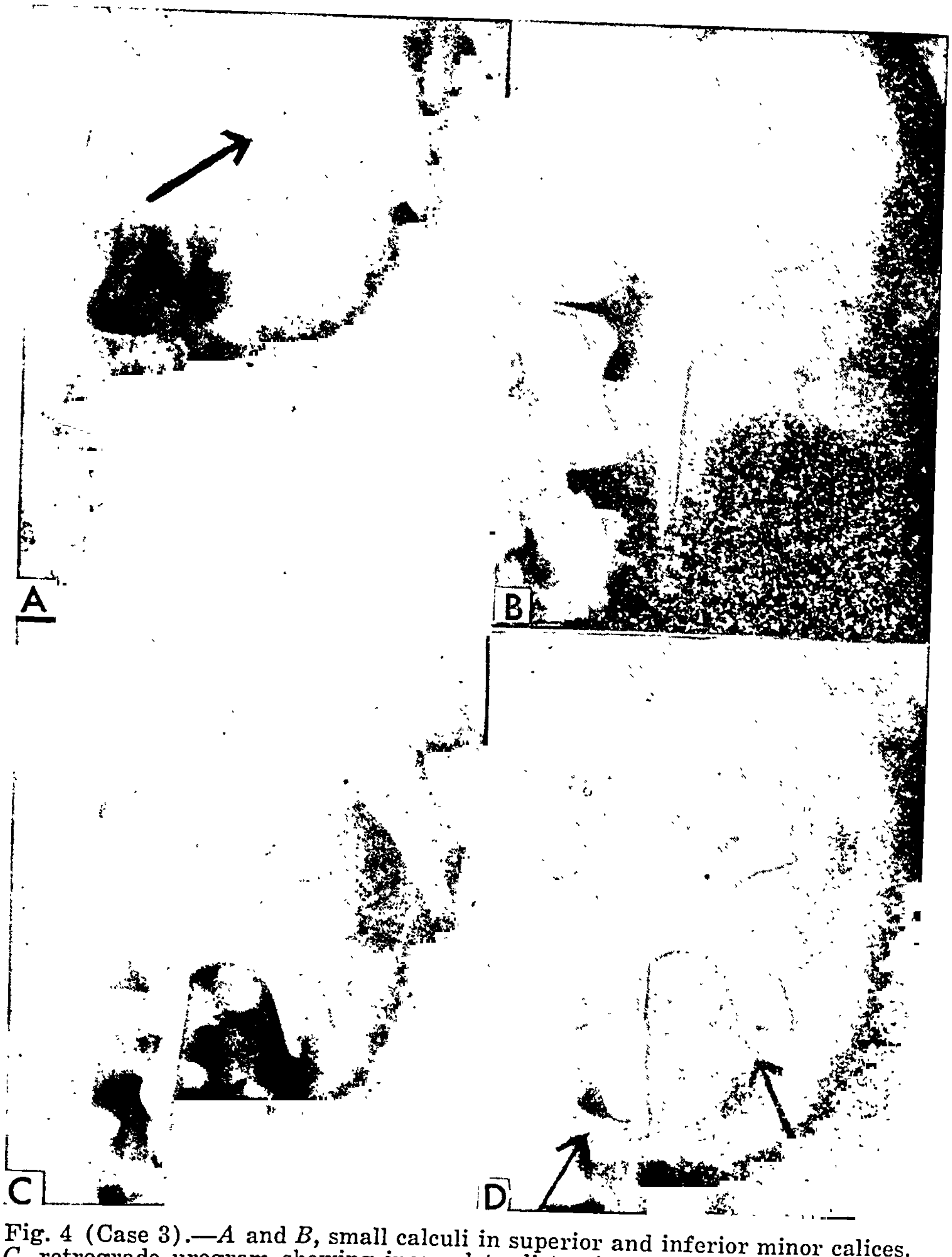


Fig. 4 (Case 3).—*A* and *B*, small calculi in superior and inferior minor calices. *C*, retrograde urogram showing incomplete distention of balloon, allowing reflux down the ureter. *D*, induced hydronephrosis with complete ureteral blockage.

phases, and hyaluronidase should be administered postoperatively. In the cases presented the calculi were removed in a relatively atraumatic manner. In this small series the incarcerated calculus was found lying free in the renal pelvis at the time of operation on three occasions, and its removal inflicted no direct trauma to the kidney. With a suitable type of calculus it should be possible to have it assume a position in the ureter from which point it would pass spontaneously or could be removed by instrumentation. In 2 of the cases the induced hydronephrosis made possible digital palpation of the calculus and facilitated its removal through a small nephrotomy incision. Case 3 illustrates the instrumental removal of a tiny plaquelike calculus that would usually be disregarded. Nephropexy was performed whenever the kidney was completely mobilized. Early ambulation was encouraged.

The most favorable site for ureteral blockade appeared to be about 3 to 5 cm. distal to the ureteropelvic junction; adequate hydronephrosis is produced in one to two hours. The presence of advanced perirenal and periureteral adhesions militates against the rapid development of hydronephrotic change, as was demonstrated in Case 5. The pain occasioned by ureteral blockade is easily controlled by moderate dosage of narcotics.

This type of catheter could be used wherever irrigation of the calyceal system is desired, the balloon tending to maintain the catheter in the renal pelvis.

SUMMARY

The technic of induced hydronephrosis is described in detail, and its use advocated in the surgical management of small symptomatic renal calculi.

This method permits the relatively atraumatic removal of small renal calculi incarcerated in a minor calyx.

Six consecutive cases are cited in which this technic was utilized successfully.

ZUSAMMENFASSUNG

Die Technik der künstlich erzeugten Hydronephrose wird in ihren Einzelheiten beschrieben, und die Anwendung des Verfahrens bei der chirurgischen Behandlung kleiner mit Krankheitserscheinungen einhergehender Nierensteine wird empfohlen.

Die Methode ermöglicht die Entfernung kleiner in einem schmalen Nierenkelch eingeklemmter Harnsteine mit verhältnismässig geringer Traumatisierung.

Es werden sechs aufeinanderfolgende Fälle angeführt, bei denen diese Technik erfolgreich zur Anwendung gelangte.

SUMARIO

A tecnica da hidronefrose induzida é descrita detalhadamente e seu uso defendido na cura cirurgica de cálculos renais com pequena sintomalogia.

Este método permite a remoção relativamente atraumática de pequenos cálculos renais encerrados no "minor calix."

Seis casos consecutivos são citados nos quais esta tecnica foi utilizada com resultado satisfatorio.

RIASSUNTO

Viene dettagliatamente descritta la tecnica della idronefrosi procurata e il suo uso consigliato nel trattamento chirurgico dei piccoli calcoli renali sintomatici. Tale metodo permette in modo relativamente non traumatico la rimozione dei piccoli calcoli renali incarcerati in un calice minore. Vengono citati 6 casi consecutivi in cui questa tecnica fu usata con successo.

RÉSUMÉ

La technique de l'hydronephrose artificielle est décrite en détail, et son usage est recommandé pour le traitement chirurgical des petits calculs rénaux symptomatiques.

Cette methode permet l'élimination rélativement atraumatique de petits calculs incarcérés dans un calice mineur.

Six cas consécutifs son décrits ou cette technique était suivie de succès.

Urologic Aspects of Pelvic Phlebography

ARMINIO DE LALOR MOTTA, M.D., F.I.C.S.*

RECIFE, BRAZIL

VENOGRAPHIC procedures are already customary in medical practice; in many cases, almost a matter of routine. Reviewing the bibliography on this subject, one must refer especially to the true pioneers of this method, Egas Munis and Reinaldo dos Santos. It was these two Portuguese scientists who studied the angiographic technic in its different phases — opacifications of arteries, veins and capillaries.

Roentgenographic examination of the periprostatic venous system, of the perivesical veins and of the deep veins of the pelvis after injection of a contrast medium into the deep dorsal vein of the penis (or into the cavernous bodies or the spongiose bone tissue in the pelvic region) is a relatively new method of diagnosis. When Abeshouse and Ruben (1952) started their important phlebographic study there was no reference in the *Quarterly Cumulative Index* to periprostatic and perivesical venographic investigation. The observations of these authors were presented at the Annual Congress of the Mid-Atlantic Division of the American Association of Urology at Philadelphia and were reported in the *Journal of Urology* in September 1952. Reports on this subject were also published by Fitzpatrick and Orr in the same periodical.

Apparently the first to inject a contrast medium into the deep dorsal vein of the penis in order to study the metastasis of cancer of the prostate was Batson (1940). Some years later (1946), Johnston, as well as De Leeds, tried to confirm Batson's results.

Ducuing and his colleagues reported the history of this subject, which was also presented by Anselen, assistant and collaborator of Prof. A. de la Pena. Dr. de la Pena's work was started in 1946.

Only after the appearance of these studies did Estella (1948) demonstrate the important work of de la Pena at the Nineteenth Congress of the International Society of Surgery of London, as a contribution to the report entitled "Arteriography and Phlebography" by Prof. Reinaldo dos Santos. At the forty-second French Congress of Urology, which took place in Paris, de la Pena and Anselen (1948) presented a study on pelvic phlebography.

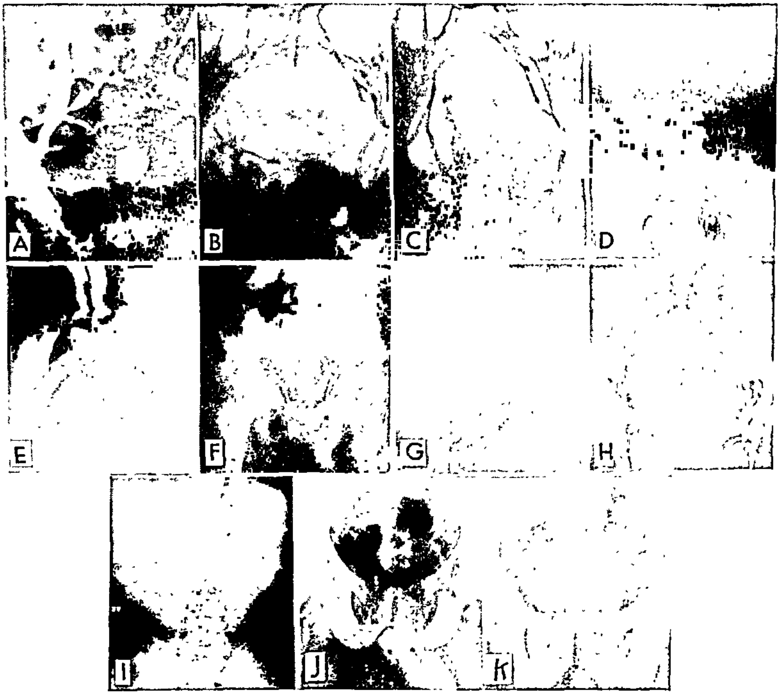
Anselen (1950) wrote a thesis on the same subject and presented it at the Medical School of Madrid. He also published other articles on the pelvic venous circulation, proceeding at first from the penis through the deep femoral vein, later through the superficial vein and finally through the cavernous bodies, as Beaux (1950) had done before.

It is still pertinent to mention the work of Souza Pereira on opacification of the portal system through injection of a contrast medium into the inferior hemorrhoidal vein or through the cecal vein in the course of an appendectomy.

Ducuing and his collaborators, in 1951, published their observations on phlebographic study of the pelvis. Their purpose was to study the venous picture after abdominal surgical procedures. They first injected a contrast medium into the deep dorsal vein of the penis, as Prof. de la Pena had done in 1948; then, by a similar technic, they made injections into the dorsal

---

*Professor of Urology, Recife University Medical School. Submitted for publication Jan. 19, 1956.



A, prostatic phlebogram taken in a case of carcinoma of the prostate. Right lateral veins removed, accentuated to distinguish them from left. *B*, pelvic phlebogram in a case of benign prostatic hypertrophy. Veins removed on both sides. *C*, carcinoma of the prostate, with thrombosis on both sides and obstruction on the left. *D*, excretory urogram taken after phlebographic study with contrast medium injected into cavernous bodies. Note bilateral dilatation renal pelvis. *E*, pelvis phlebogram in a case of carcinoma of the prostate, taken after injection of contrast medium into cavernous bodies. Note obstruction of veins at left of prostatovesical plexus. *F*, pelvic phlebogram taken in same manner. Note small and numerous thromboses, with obstruction on left side. *G*, pelvic phlebogram taken in cavernous bodies in a case of adenoma of the prostate. Observe prostatovesical removal on both sides and increase in size of veins. *I*, excretory urogram with contrast medium in cavernous bodies. Observe good function of both kidneys and double pyeloureter on right side; note also ureteral angulation on same side. *J*, pelvic venogram in a case of carcinoma of the prostate. Note thrombosis of veins in Santorini's plexus and partial restriction of lateral veins. *K*, cystogram taken after injection of contrast medium into cavernous bodies in same case. Note prominence of neoplastic mass at neck of the bladder.

vein of the clitoris and into the female cavernous body.

These authors obtained good visualization of the veins, but the study of men w difficult, for technical reasons that dered the use of the technic. This justifies (Drasnar, 1945) their injecting a contrast medium into the horizontal branch of the ubis and e ding the injection to the ar pelvic region (iliac crest, ischium, sacrum and trochanter). The results were good from the phlebographic point of view, and excellent visualization of a number of the deep pelvic veins was obtained. The ease with which the contrast medium passed through the spongiose bone to the general circulatory system was mentioned in the authors' report.

Ducuing and his associates studied, in detail, the means of exploration of the pelvic veins and demonstrated the advantages of injection into the circulatory system in order to visualize the veins in general. The following methods were used:

1. Injection into an artery, a method first employed by Egas Muniz and Reinaldo dos Santos.

2. Injection into the venous trunks. This is now common procedure in clinical venous urographic study. The first attempt at opacification of urine dates from 1923 in the United States, simultaneously with the publications of School in Germany and Rowentry and Southerland, Von Lichtenberg, and Rosenstein and Pecco in Italy. When Roseno in 1929 introduced "pielognost" as a means of obtaining contrast it was Aguinaldo Lins, Director of the Radiologic Service in the School of Medicine of the University of Recife, who first introduced this method in Brazil, and perhaps the first to use it in South America. The injection can also be made (a) into the cavernous bodies; (b) into the bones through the spongiose parts of the whole skeleton, and (c) through the arteries. Arterial venographic study is not used for the pelvis. The venous patterns obtained after an arterial injection for a low aortogram are difficult to obtain through the veins. It is possible to opacify the venous system of the pelvis by injecting the femoral vein, but the opaque medium stays in the main trunks—the external iliac, the primitive iliac — sometimes flowing back slightly into the hypogastric vein. Opacification may be obtained through a hemorrhoid, but the image is not sufficient, the contrast medium passing to the portal system through the superior hemorrhoidal vein. In opacification through the cordon veins the medium passes through the external and primitive iliac veins, sometimes flowing slightly into the hypogastric vein and its branches. The most interesting images are those obtained by injections made into the deep dorsal veins of the penis and of the clitoris. The authors mentioned the excellent images obtained through the cavernous bodies. As for the bones, the aforementioned authors opacified the veins of the pelvis through the pubis, employing the ischial, the trochanteric or the sacral route. Phlebographic study of the pelvis is valuable for the following purposes: (a) the study of phlebitis; (b) the demonstration of indications for treatment of thrombosis and its consequences, and (c) the study of the anatomic and physiologic picture in detail.

The authors have stated that it is necessary to know the scheme of the venous system in the pelvis in order to collect and study pelvic phlebographic data. These are the parietal and visceral plexuses. Among the first group, one anterior, or external, and one posterior, or sacral, group can be identified. There is also one superior, or iliolumbar, and one inferior, or pudendo-internal group, but these were not described by the authors.

Among the visceral courses, they mentioned one as anterior, or vesical, one as median, or genital, and one as posterior, or rectal. They concluded that injection of a contrast medium into the deep dorsal vein of the penis and through the cavernous bodies has the advantage of opacifying both sides and enabling one to visualize a small part of the vesical system, the inferior vesical veins.

Nevertheless, they added, the transosseous approach offers numerous advantages, such as facility of performance and the fact that it permits the injection of a liberal amount of contrast medium, so that excellent impregnation of the veins is possible. It is easy to see the importance of these studies of venous thrombosis when one remembers the value of an early diagnosis leading eventually to surgical intervention.

The research of Ducuing and his colleagues on the signs of venous thrombosis led other investigators to make a study of the frequency of pelvic phlebitis (Beaux and Poulhes, 1950).

Since 1945, de la Pena has been using the median superficial and deep veins of the penis to study the extent and the morphologic character of the venous plexus of the male pelvis. According to what happens in the presence of ascites, hepatic cirrhosis or phlebitis, venous roentgen radiographic study permits one to observe the extent and variety of the plexus of Santorini and the insufficiency of the venous valvular system. The speed of venous circulation in the pelvis may be evaluated through multiple roentgenograms.

Abeshouse and Ruben (1955) made an important study of this subject and concluded that roentgen studies of the pelvic venous systems is a simple process, neither expensive nor dangerous. It enables one to know the trajectories and distribution of the veins of the anterior surface of the prostatic region, as well as to locate the juncture of the prostate vesical and the lateral vesical plexus. In addition, it is a valuable aid in differentiating between cancer of the prostate and adenoma of the prostate. It also has subsidiary value in diagnosing thromboses of the pelvic veins in cases of priapism or of venous disturbances caused by perivesical infections; of benign and malignant tumors of the pelvic organs; of lesions of the retropelvic tissues; of pathologic changes in the rectal area, and of neoplasms of the penis, the urethra, the testes and the seminal vesicles.

The urologic importance of periprostatic and perivesical phlebographic studies is obvious. This was made clear in the thesis of Walter Costa (1953). His work, perhaps the first South American contribution on this interesting subject, was done in the Urologic Department of the School of Medicine of the University of Recife, where all the basic elements necessary to its development were arranged. In a series of fifteen phlebographic films obtained by injection of a contrast medium into the deep femoral veins of the penis, he demonstrated the changes that occur in the topographic disposition of the veins of the anterior prostatic region and of the vesical neck. He concluded that the pelvic phlebograms showed only one plexus and that adenoma of the prostate causes topographic modifications therein. This characteristic aspect permits confirmation of the increased volume of the prostate.

These results justify the eclectic methods adopted with regard to the capsular incision to be used and the rationale of making the decision according to the distribution of the veins, which were generally increased in both number and volume. This explains the vertical, transverse, oblique and even semicircular incisions. In a hemorrhagic region, this safeguards the patient from the massive hemorrhages to which the urologists have referred.

Phlebographic study of the periprostatic and perivesical regions, as Costa (1953) noted, demonstrates the variations observed in the prostatic region, which make it impossible to standardize the manner of incision of the capsule. There is no disagreement as to the modifications in the urinary system caused by adenoma of the prostate. Every urologist [illegible] ows the pathologic patterns of this [illegible] acteristics and the chan [illegible] (a) the ure [illegible] stretc part, changing its direction, increasing its anterior and posterior diameters and flattening it in its transverse dimension; (b) the neck of the bladder—modifying its caliber, raising it and producing deformities; (c) the bladder—altering its form, structure and capacity, and (d) the kidney and the ureter, with dilatation of the latter, sometimes bilateral, causing disturbances in the flow of urine.

Besides these well known changes, there are some that take place in the prostate and the ejaculatory channels which also can be observed by pelvic phlebograms of the modifications caused by the prostatic adenoma in the Santorini plexus, those already known and those observed in the performance of the aforementioned retropubicadenomectomy. Without a doubt, this represents a great advance; in addition to enabling one to observe the changes caused by the adenoma in the periprostatic and perivesical veins, it also permits one to verify the imperfect opacification of the vessels concerned in the venous obstruction associated with prostatic carcinoma.

As to the technic of pelvic phlebography, I wish to present some modifications that permit the study of Santorini's plexus and the kidney, ureter and the bladder, i.e., the phlebographic and excretory urographic investigations that precede roentgenographic study of the urinary organs. It is necessary to keep the objective in mind. The aim of phlebographic study of the male pelvis is to determine the changes caused by the adenoma in the urinary system, to study the roentgen aspects of urinary lithiasis and to make an evaluation that is most important, the evaluation of renal function. Also important is the study of the association of these changes with those caused by other latent urinary infection.

I prefer the cavernous approach. The excretory urograms and phlebograms that illustrate this article show its advantages clearly. Local reaction is insignificant or absent if a good contrast medium is used —one that does not elicit phlebitic reactions when injected in large quantity. My conclusions are in accordance with those of the authors mentioned who are employing pelvic phlebographic methods to examine the changes caused by the tumor in the periuretheral and the perivesical venous system. It is true that phlebography is in its infancy. Its interpretation is not easy, and therefore it is subject to errors, which must be corrected. In spite of this, the study of my patients seems to demonstrate (a) topographic alterations of Santorini's plexus; (b) an increase in vascularization, and (c) in the case of prostatic carcinoma, thrombosis and venous obstruction, signs suggesting the existence of metastasis. If one takes care to inject more contrast medium than usual before taking phlebograms of the male pelvis, one can also obtain an excretory urogram that permits interpretation of renal function and visualization of the topographic modifications of the renal pelvis, the ureter and the bladder. The illustrations in this article give a good demonstration of the curious appearances.

SUMMARY

The author presents a bibliographic review of venographic studies of the pelvis from Batson through de la Pena, Anselen, Baux, Abeshouse and Costa. He emphasizes the advantages of the cavernous approach, which makes it possible to inject an ample amount of contrast medium and so enables the investigator to perform phlebographic and venous urographic examinations at the same time. He also emphasizes the fact that the phlebographic method provides an excellent demonstration of the changes caused in the Santorini plexus by neoplastic masses. Periuretheral adenoma pushes out the lateral branches

and augments the venous picture; prostatic carcinoma is associated with thrombosis and obstruction. Awareness of these changes, in the author's opinion, provides an interesting addition to the knowledge of the student or practitioner of modern urologic surgery. The possible advantages of the phlebographic technic in the differential diagnosis between adenoma and sarcoma of the prostate are pointed out.

SUMARIO

Estudando a Venographia pelvica e A. apresenta uma revisao bibliografica sobre esse moderno tema urologico desde Batson, atraves De La Pena, Anselen, Baux, etc. ate Walter Costa. Assinala as vantagens da via cavernosa na qual e possivel uma injecao generosa do contraste, o que permite a pratica na mesma sessao de flebografia e da urografia excretora.

Refere que o metodo flebografico define bem as modificacoes que as massas neoplasicas provocam no plexo de Santorini, afastando os ramos laterais e dando uma abundante suplecia venosa na Hipretrofia da prostatae demonstrando tromboses, apagamento e obstrucoes no cancer da prostata. Diz o A. que o conhecimento dessas modificacoes constitui moderno e interessante acressimo ao capitulo que estuda as modificacoes que o Adenoma da Prostata provoca no aparelho. Relata, ainda, a vantagem da possibilidade que o metode confere de cooperar para o diagnostice diferencial entre o Adenoma e o *Cancer da Prostata.*

RÉSUMÉ

L'auteur présente une revue bibliographique des études veinographiques pelviennes de Batson, Anselen, Baux, Abeshouse and Costa. Il accentue les avantages de l'application caverneuse, par laquelle il est possible, d'injecter une grande quantité de contrast, et comme ça l'investigateur est capable, de faire l'examen phlébographique et urographique veineux en même temps. Aussi il explique, que la méthode phlébographique démontre excellement les lésions faites dans le plexus Santorini par des néoplasmes. Dans le cas d'un adénome periuréthral les branches latérales sont poussées de coté; ainsi le film intraveineux est suppléé. dans le cas d'un carcinome de la prostate on voit des thromboses et de l'occlusion. L'auteur est de l'opinion, que l'apparence des lésions montre un symptôme intéressant additionel à l'etudiant et à celui qui pratique la chirurgie urologique moderne. Les avantages possibles du diagnostic différentiel d'adénome et sarco me de la prostate sont mis au point.

RIASSUNTO

Viene presentata una rassegna bibliografica sulla bibliografia pelvica. L'autore mette in luce i vantaggi della iniezione transcavernosa che con sente l'introduzione di grandi quantità di liquido di contrasto così da rendere possibile la flebografia e l'urografia contemporanea. Si ottiene inoltre una eccellente dimostrazione delle masse tumorali sul plesso di Santorini; negli adenomi peruureterali e nel carcinoma prostatico si pos sono mettere in evidenza trombosi ed occlusioni. Tali modificazioni, secondo l'autore, possono essere di grande aiuto nello studio e nella pratica della moderna chirurgia urologica. Fra l'altro diviene possibile la diagnosi *differenziale fra sarcoma e adenoma prostatico.*

ZUSAMMENFASSUNG

Der Verfasser legt eine Übersicht der Arbeiten über phlebographische Beckenuntersuchungen vor, die die Literatur von Batson über de la Pena, Anselen, Baux bis Abeshouse und Costa umfasst. Er hebt die [illegible]ngangswege über die

Schwellkörper hervor, der die Einspritzung einer reichlichen Menge des Kontrastmittels ermöglicht und somit dem Untersucher gestattet, phlebographische und urographische Studien zur gleichen Zeit anzustellen. Er betont ferner, dass das phlebographische Verfahren eine ausgezeichnete Darstellung der durch Neubildungen verursachten Veränderungen im venösen Schamgeflecht ermöglicht. Beim periureterischen Adenom werden die lateralen Äste verdrängt, beim Prostatakarzinom gelangen Thrombosen und Verstopfungen zur Darstellung. Der Verfasser glaubt, dass die Kenntnis dieser Veränderungen einen interessanten Beitrag zum Studium und zur praktischen Behandlung der Probleme in der modernen Chirurgie der Harnorgane liefert. Er weist ferner auf die durch das phlebographische Verfahren sich bietenden Möglichkeiten hin, zwischen Adenom und Sarkom der Prostata zu unterscheiden.

BIBLIOGRAPHY

Abeshouse, B. S., and Ruben, M. E.: Prostatic and Peri-Prostatic Phlebography, J. Urol. 68:640, 1952.

Abeshouse, B. S., and Ruben, M. E.: Phlebographic Study of the Pelvic Venous System by Injection of the Deep Dorsal Penis in the Living Patient, J. Internat. Coll. Surgeons 19:576, 1953.

Anselen, A.: Metastase meningeia de um carcinoma da Prostata, Rev. Clin. Espanhola 6:393, 1950.

Anselen, A.: Contribucion al estudio de la fisiologia y fisiopatologia de la circulation venosa y al mecanismo de la producion de la trombosis en general de membros inferiores en la cirurgia de abdomen, Tesis, Madrid. In Clinica e Laboratorio, 1950A, p. 286.

Batson, O. V.: The Function of the Vertebral Veins and Their Role in the Spread of Metastases, Ann. Surg. 112:138, 1940.

Baux, R., and Poulhes, J.: La Phlebographie Pelvienne, J. de Radiol. & Electrol. Paris: Masson et Cie, 1950, p. 7.

Cicarelli, G.: Ulteriore Contributo all Conoscenca della Flebographia Dei Vasi Pelvici, Att. Soc. Ital. Urol. 17:377, 1953.

Costa, W.: Estudo Flebografico das Modificacoes topograficas do Plexo de Santorini no Adenoma Peri-Uretral (Suas relacoes com a Cirurgia Retro Pubica), Tese. Fac. Med. Univ. Recife, Pernambuco, Brazil.

De la Pena, A.: Flebografia de plexos e vasos pelvianos en el vivo, Rev. Esp. de Cirurgia 4:245, 1946.

De la Pena, A., and Anselen, A.: A Flebographia Pelviana, Compt. Rend. 402-403, 1946.

Drasna, V.: Intraspongiose Dauer Tropinfusion-Scheiz, Med. Wschnschr. 36:876, 1946.

Ducuing, J.; Marques, P.; Baux, R.; Paille, J., and Voisin, B.: Fisiologie de la Circulation des os, J. de Radiol., Electrol. et Arch. d'Electricite Med. 32:189, 1951.

Ducuing, J., and others: Les differentes voies d'exploration pelviennes par la Phlebographie, J. de Radiol., Electrol. et Arch. d'Electricite Med. 32:212, 1951.

Estela, J.: Relatorio sobre o tema do Prof. Reinaldo dos Santos sob o titulo Arteriografia e Flebografia. Apresentado ao 12º Congresso Internationale de Chirurgie Londres. Inprimerie Medicale et Scientifique (S. A.) Bruxelles, pp. 302-307.

Fitzpatrick, R. L., and Orr, L. M.: Pelvic Prostatic Venography, J. Urol. 68:647, 1952.

Johnston, A. S.: Experimental Study of the Vertebral Venous System: Preliminary Report, Proc. Roy. Soc. Med. 39:538, 1946.

Correction: In the January issue of the Journal there appeared two articles by Dr. Aldo Parentela of Rome, Italy: "Experimental Approach to the Aortic Valve in the Dog" and "Further Experiences in the Surgical Repair of Experimentally Produced Atrial Septal Defects." Under a misapprehension, these were incorrectly given the serial numbers I and II; also Figure 2*B* in the second article appeared in the wrong position. These errors have been corrected on Dr. Parentela's reprints. The Journal sincerely apologizes, both to Dr. Parentela and to readers of the two articles, for these unfortunate errors.

Pelvic Surgery in Women: Intra-Abdominal Complications

LEONARD COWAN, M.D., C.M., F.I.C.S.
REGINA, SASKATCHEWAN, CANADA

GYNECOLOGISTS are all only too well aware that almost any intra-abdominal surgical pathologic condition that confronts the general surgeon may coexist with the gynecologic or obstetric condition for which the patient primarily seeks treatment. Medical complications such as diabetes, leukemia, cardiovascular-renal conditions, infections of the respiratory tract, tuberculosis, etc., may jeopardize the patient's postoperative course if they are not recognized and taken into account when any pelvic operation is planned. I do not consider it out of place to mention the fact that complete preoperative investigation of all candidates for pelvic surgical intervention is still the best prophylaxis against serious operative and postoperative complications. At present there is an ever-increasing trend toward sectional investigation and treatment rather than adequate assessment of the whole patient, the extent and effect of her disease and the prognosis following the procedures recommended.

The surface having been scratched, so to speak, it is inferred that all patients for whom any type of pelvic operation is considered must have the benefit of a complete history and physical examination, followed by the indicated laboratory tests, roentgen studies and other investigations. After years of searching for alternatives it is still a fact that I have had best control of the patient where I have taken the history and carried out a complete examination personally, even though this has already been done by others—assistants, residents or interns.

Preoperative measures, in particular, to reduce the incidence of intra-abdominal complications may be summarized as follows:

1. Build up the patient's general physical condition to as high a level as possible.
2. See that the patient is rested and relaxed.
3. Proceed with care in the immediate preoperative preparation; e.g., omit cathartics and enemas when they are not definitely indicated. Saline irrigations, however, are permissible to empty the lower portion of the bowel when pelvic repairs are contemplated.

The preoperative "bowel toilet" is stressed when one suspects the presence of any intestinal abnormality that may necessitate interruption of the integrity of the bowel wall. An example of this might be the involvement of bowel in old left pelvic abscess due to diverticulitis.

4. Observe caution in the use of the douche. For the past nine years I have not used a preoperative or postoperative douche in any obstetric or gynecologic case. There has been no increase in postoperative sepsis of any type. Routine triple sulfa vaginal applications are used twice a day preoperatively and again post-

---

Read at the Twentieth Annual Congress of the United States and Canadian Sections, International College of Surgeons, Philadelphia, Sept. 12-15, 1955.
Submitted for publication Jan. 28, 1956.

operatively. The majority of patients are given four treatments prior to operation. The incidence of vaginal and vulval urticaria or irritation is much below 1 per cent. Systemic absorption of the sulfas from the vagina is negligible.

A preoperatively reassured, relaxed patient seems to be in less danger of postoperative intra-abdominal complications than is a hurried, inadequately prepared one. Therefore, when circumstances permit, it is always advisable to have the patient under supervision in the hospital for thirty-six to forty-eight hours before a pelvic operation is performed. When associated disease is present, preparation may be prolonged for days or even weeks while (for example) the internists stabilize diabetic or cardiac patients, thereby decreasing the operative risk and increasing the postoperative recovery index. Patients are catheterized preoperatively, and for pelvic laparotomies the catheter is left in the bladder and open during the operation. It is removed before the patient leaves the operating room.

At operation, measures to prevent sepsis are taken. The skin is prepared in the usual manner by painting with a nonirritating solution. Since I have never been convinced that skin towels reduce the incidence of wound infection, they are not used. Skin towels tend to restrict the natural elasticity of the skin and reduce exposure.

All tissues are handled gently, either manually or with instruments. Gentleness and respect for tissues should never be sacrificed for speed. A surgeon who operates rapidly may be excused slightly increased roughness; one who works slowly must be very gentle, for slow rough handling of tissues is inexcusable and leads only to grief. Minimal tissue trauma over the shortest period should be the object of all technics.

Accidental injury to the bowel should be avoided by adequate anesthesia to reduce the necessity of heavy pressure against the retracted bowel or any other tissue. Light packing of the bowel from the operative field seems to produce no increase in postoperative complications. All damage to bowel must be recognized and repaired immediately.

Careful hemostasis and strong reconstruction of the abdominal wall complete the operation and prepare the patient for early ambulation and a quick return to normal function. No heavy dressings are used; a narrow light gauze dressing is held in place with two or three narrow strips of adhesive tape.* This type of dressing allows free circulation of air, and no increase of wound infection has been observed. The incision stays dry and clean, and the original dressing is not disturbed until the fifth day, when alternate skin clips or sutures are removed, the remainder being left until the sixth day. Abdominal binders are not used routinely.

The postoperative prophylaxis of bowel complications is improved by early ambulation. Gradual increase to a full diet within thirty-six to forty-eight hours, or as best tolerated by the patient, is recommended.

When signs of postoperative distention appear, either gastric suction or intestinal decompression is instituted as soon as the patient starts to vomit and before the presence of ileus can be established. Signs of peritoneal irritation usually accompany distention of the bowel.

When the patient cannot eat and drink to maintain fluid and electrolyte balance, reestablishment and maintenance are obtained by adequate parenteral therapy and checked by laboratory tests. Ileus is treated by complete rest for the bowel and continuous suction with a Miller-Abbott or a Cantor tube. It may be noteworthy that Bastiaanse of Amsterdam pointed out that ileus can be produced solely by traction on the omentum. He made special mention of this in describing his repair for vesicorectovaginal fistula, in which the omentum is used as packing in the vault of the vagina. It is possible that tidying the intra-abdominal contents and placing the omentum along the pelvic peritoneal suture line at operation, when the patient is relaxed and anesthetized, results in undue traction when the patient is conscious and the muscle tone restored. This may be a factor in producing ileus, which, while not common in gynecologic surgical practice, is nevertheless a serious complication.

---

*From Oct. 1, 1955, no dressings of any kind have been used on abdominal incisions. Healing is satisfactory. There has been no wound sepsis up to the time of writing (April 19, 1956).

Postoperative intraperitoneal infections that result in abscess despite antibiotics and decompression of the bowel are treated with watchful waiting for the focus to subside or point. Too early intervention leads only to trouble. A pelvic abscess will drain spontaneously, in many instances, through the sigmoid portion of the colon or through the rectum. Spaced pelvic and rectal examinations will determine whether and when the fluctuating mass is to be drained *per vaginam* by posterior colpotomy.

When distention is accompanied by serosanguinous discharge from the incision, which is quickly seen and recognized through the light dressing, a defect in the healing of the incision is certainly present. No advantage (except temporary balm to the surgeon's pride) is gained by waiting for the incision to separate further. Immediate resuturing is necessary to prevent dehiscence of the bowel. Seventy-five per cent of mechanical defects in wound healing have been associated with respiratory complications, such as pneumonia or postoperative atelectasis accompanied by coughing. I have never encountered an instance of incomplete healing of the abdominal wall that could be attributed to failure or infection from the suture material *per se*.

Intestinal obstruction in the gynecologic and obstetric field may be caused by adhesions due to previous operation or to inflammation of the small bowel complicated by volvulus, direct extension of new growth, metastatic spread of new growth, endometriosis implants and mechanical obstruction of the large bowel. The last may be dramatically generated by the particular shape and size of the uterus, which is sometimes distorted by tumor, pregnancy, previous operations or ovarian tumors. The mechanical causes of obstruction of the large bowel are important because of the relative simplicity and the ease of treatment and cure when the diagnosis is made at an early stage.

REPORT OF CASES

CASE 1.—A white woman aged 36 had undergone a low segment cesarean section for absolute cephalopelvic disproportion, performed in England in 1943. Suture material of any type was at a premium, owing to war restrictions and shortages. The postoperative course was very stormy with abdominal distention, ileus, peritonitis and a long convalescence. The patient first consulted me in Canada in 1947, for a mucopurulent vaginal discharge that had persisted, in varying degrees, since the cesarean section four years earlier.

On examination a knot and loop of what appeared to be thick string was removed from the cervical canal. The suture material used must have been either coarse cotton or linen. The discharge cleared for approximately six months and then returned. Since no suture could be found at office examination, the patient was hospitalized for a diagnostic dilation and curettage. The second suture was removed from the uterine cavity with small ovum forceps. The third complete suture was found embedded in the anterior wall of the uterus, just beyond the internal os when it snagged the ovum forceps. Eventual removal was accomplished by sliding the tip of a uterine packing forceps into the loop of suture. Gradual leverage dislodged it intact. At pelvic examination, with the patient anesthetized, the cervix was pulled forward behind the symphysis pubis and showed restricted mobility. The [illegible] portion of the anterior wall [illegible] fixed firmly to the lower the fundus could be tipped by pressure to a retroverted position.

Subsequently the patient's health improved, and there was no recurrence of vaginal or uterine discharge. Since there had been no pregnancies for six years, she adopted a baby in 1948. The patient became pregnant at the end of February 1949. Except for nausea and vomiting the pregnancy proceeded without serious incident until, at thirty-eight weeks, the patient showed signs of infectious or toxic hepatitis. At this time the internist consultant advised immediate cesarean section, since absolute disproportion was again present and the jaundice, etc., was expected to increase in the course of the disease. A healthy female child was delivered.

The immediate postoperative condition of the patient was satisfactory. On the third postoperative day very severe hemorrhoids and commencing abdominal distention were evident. A Miller-Abbott tube was passed and intravenous therapy commenced. On the fourth day there was increasing abdominal distention, and no flatus passed rectally. A flat plate of the abdomen showed grossly distended large bowel only, suggesting a competent iliocecal valve. The grossly distended bowel included the ascending, transverse and descending portions of the colon. At laparotomy after consultation with two general surgeons, the uterine incision was observed to be healing well, without intestinal involvement. No cause could be discovered for the distention until the large bowel was deflated by insertion of a cannula into the ascending portion of the colon after placement of two concentric purse-string sutures in the stretched and thinned wall. Exploration then revealed obstruction of the sigmoid portion of the colon at the brim of the pelvis, produced by the fixed involuting uterus. A rectal tube was gently inserted past the brim of the pelvis by an assistant while the tip was guided intra-abdominally with direct palpation. The abdomen was closed without drainage, and the patient subsequently recovered from both obstruction and hepatitis.

CASE 2.—A white woman aged 73. Two days postoperative after pinning of a fractured right hip there was diagnosis of large bowel obstruction. Consultation was requested by the orthopedist on advice of the general surgeon when the presence of a pelvic tumor was suspected after rectal examination. The patient was very frail; her general condition was poor, and she had been considered a poor anesthetic risk for the orthopedic procedure. Pelvic examination revealed a retroverted uterus enlarged by a smooth posterior fundal tumor wedged in the cul-de-sac. Permission was granted by the orthopedist to turn the patient to a semiprone position and raise the hips slightly on pillows. Steady rectovaginal pressure combined with light traction on the cervix with a tenaculum displaced the uterus, after which flatus passed freely. The patient subsequently recovered. The diagnosis was posterior fundal fibroid, retroverted impacted uterus and obstruction of the large bowel.

CASE 3.—A white woman aged 75 had had intermittent alternating constipation and diarrhea for many years. There had been no previous operations. The patient was admitted for emergency treatment of large bowel obstruction. The diagnosis was confirmed by a general surgeon. A request for consultation followed. At consultation a solid tumor of the left adnexae was diagnosed, tentatively as the Krukenberg type. A left oophorectomy was done for an oval serous cyst measuring 10 by 7 by 7.5 cm., with 180-degree clockwise torsion of the pedicle. This twisted cyst was jammed in the left side of the pelvis. Quick section resulted in the diagnosis of simple serous cyst adenoma of the ovary. Exploration of the remainder of the intraperitoneal contents revealed no abnormality. No further surgical intervention was required. The patient made a complete recovery.*

SUMMARY

An outline, listing preoperative measures and some surgical routines for prophylaxis of intra-abdominal complications, is presented. Some postoperative complications are reviewed, and 3 cases of mechanical obstruction of the large bowel due to pelvic causes, are outlined.

---

*A recent personal communication from an Eastern Canadian hospital mentions 3 recorded cases in which postpartum patients who had undergone no previous surgical treatment had obstruction of the large bowel due to impaction of the involuting postpartum uterus, solely because of its particular size and shape in each instance. In all 3 cases the patients were operated on for relief of the obstruction. A fourth patient with the same diagnosis was treated simply by insertion of a soft rectal tube past the brim of pelvis and made a complete recovery. Removal of the rectal tube in two days did not result in recurrence, since the continuing involution of the uterus had sufficiently decreased its bulk to preclude recurrence of the same pressure on the sigmoid portion of the colon.

ZUSAMMENFASSUNG

Es liegt eine Übersicht präoperativer Massnahmen und einiger routinemässiger chirurgischer Eingriffe zur Verhütung von Bauchkomplikationen vor. Einige postoperative Komplikationen werden untersucht, und drei Fälle von mechanischem Verschluss des Dickdarms, bedingt durch Zustände im kleinen Becken, werden kurz beschrieben.

RÉSUMÉ

Les mesures pré-opératoires et quelq
uns des procédés chirurgicaux habituels
la prophylaxie des complications int
abdominates, sont présentées dans
grandes lignes. Certaines complicatio
post-opératoires sont passées en revue
trois cas d'obstruction mécanique du gr
intestin dûe à des troubles pelviens so
brièvement présentés.

The "sweating sickness" first visited England in 1483. "This epidemic disease," says a chronicler of 1827, "raged with such peculiar violence in England, and had so quick a crisis, that it was distinguished by the name of Ephemera Britannica . . . Though the regular physicians could not cure this fever, the irregulars and quacks made light work of it; and one doctor gives a specific remedy for it, and the formula. It consisted of filings of white metal, and conserve of oranges; to be given the third day before the full of the moon, and twelve hours before the full, as near as can be known from astronomical calculation, and also the middle of the third day after the full of the moon. Twelve doses thus given, are generally sufficient, but in the event of more being required, the full change of the moon *are to be observed! This prescription the doctor gave for the good of mankind,* with a candid confession that it is not his own, but was communicated to him by a learned gentleman; and being thus freely published, must needs obviate the ill-natured construction too often put upon human intentions."

Ophthalmologic Surgery

Head Tilting in the Diagnosis of Ocular Muscle Disturbances

WILLIAM E. KREWSON III, M.D., F.A.C.S., F.I.C.S.
PHILADELPHIA, PENNSYLVANIA

OCULAR torticollis may be defined as an abnormal position of the head caused by a disturbance of ocular motility, usually a form of paralysis of the vertically-acting muscles. The condition is variously referred to as head tipping, head tilting, abnormal head posture or corrective posture. Occasionally the position of the head may be the predominating feature of squint, especially in children. Its presence is always of great significance in the consideration of surgical treatment of the ocular muscles.

The subject of head tilting has been dealt with in a confused manner in the literature, and the cause is not always certain.

Abnormal head posture is frequently observed on examination in cases of ocular muscle paralysis. In cases of congenital origin the patient is usually unaware of the head position, which is generally accompanied by scoliosis. It is adopted in compensation in the absence of obtrusive diplopia (alternation). When the paralytic squint is acquired, the patient is aware of his head posture and assumes the position in an attempt to overcome diplopia; there are no anatomic changes in the structure of the vertebrae or their attachments. It is sometimes seen in comitant squint in older patients, most likely having been of paralytic nature in early infancy.

Actually, most vicarious rotations of the head of ocular origin, on careful analysis can be subdivided into various components. Diplopia, the most annoying symptom of paralytic squint, by its nature will determine in large part the abnormal head posture. Horizontal diplopia, crossed or uncrossed, may be minimized by turning of the head to one side or the other. Vertical diplopia may be lessened by elevation or depression of the chin. Torsional diplopia is decreased by tipping of the head toward one shoulder.

Paralysis of Horizontally-Acting Muscles. — The simplest situation is that of paralysis of a horizontally-acting muscle. In the case of paralysis of the right lateral rectus, for example, the right eye rotates inward and the patient suffers from uncrossed horizontal diplopia, the greater separation of the images being to the right. If the face be turned to the right and the eyes remain fixed, because of the optic fixation reflexes, the position is equivalent to turning the eyes to the left, where diplopia

---

Read at the Twentieth Annual Congress of the United States and Canadian Sections, International College of Surgeons, Philadelphia, Sept. 12-15, 1955.
Submitted for publication March 2, 1956.

is less or absent. The reverse is true in cases of paralysis of the medial rectus muscle.

Thus, in the case of paralysis of a horizontally-acting muscle, the face is turned toward the field of action of the paralyzed muscle. Turning the face to the right is suggestive of paralysis of a right hand rotator, either the right lateral rectus or the left medial rectus, and turning to the left, either the right medial rectus or the left lateral rectus.

Long-standing paralysis may be accompanied by contracture of the direct antagonist, in which case mere rotation of the face will no longer suffice to eliminate horizontal diplopia. Because raising of the eyes causes relative divergence and lowering causes relative convergence, elevation or depression of the chin may be adopted. In the example of right lateral rectus palsy with the face turned to the right, esotropia may be further reduced by depressing the chin; and, in a case of left medial rectus palsy, exotropia may be minimized by turning the face to the right and elevating the chin.

Paralysis of the Vertically-Acting Muscles.—Postural changes considered in relation to the vertically-acting muscles present a more complicated problem. This is due to the fact that these muscles have component actions in more than one direction; not only do they act as elevators and depressors, but also as horizontal rotators, and in a torsional capacity (the principle action of the obliques).

Generally, it may be said that in patients with paralysis of an elevator, the chin is elevated, and in those with a depressor the chin is depressed.

Paralysis of Superior Rectus.—In a case of right superior rectus palsy, for instance, the muscle which normally produces elevation, adduction and intorsion, will permit the right eye to be hypotropic, and abducted, with the corneal meridian tipped outward. The patient finds the false image to be displaced upward, inward (crossed) and inclined toward the normal or left side. This is the situation when the left or nonparalyzed eye is used for fixation. Since the superior rectus is a maximum right hand elevator, by elevating the chin, the eyes are depressed in the orbits, and by turning the face to the left the eyes are in effect turned to the right. Thus, horizontal and vertical diplopia may be reduced by turning the face toward the *direction of the maximum vertical pull of* the paralyzed muscle. This rule, stressed in the literature, unfortunately is not infallible, since the amount of horizontal deviation (exotropia) in palsy of a vertical rectus may be very slight, or modified by a pre-existing eso- or exophoria. Furthermore, elevation of the chin may not be necessary, if by merely turning the head laterally, the paralytic eye is placed in adduction and out of the field of maximum vertical action of the paretic muscle. The torsional diplopia in a right superior rectus palsy, the result of extorsion of the right eye, can be decreased by tipping the head to the left or opposite shoulder, that is, by the artificial production of right cycloversion of the two eyes. If the head be forcibly tipped to the ipsolateral or right shoulder, the ipsolateral or right superior oblique in attempting to overcome the right extorsion (due to the paralysis of the right superior rectus) will cause depression of the ipsolateral or right eye. This is the basis of the Bielschowsky test for differentiating between superior rectus paralysis and contralateral superior oblique paralysis.

The tipping of the head to the opposite shoulder in a superior rectus palsy, however, is not a constant finding and may be modified by two circumstances. In tilting the head sideways, the ipsolateral or lower eye is raised slightly (the image is lowered), and the contralateral or higher eye is lowered (the image is raised). Since, in right superior rectus palsy the right eye is hypotropic, if the vertical diplopia is greater than the torsional, the patient may find greater relief by tipping the head to the right or paralyzed side and raise the paretic eye. This is contrary to the above-mentioned rule, and is encountered frequently in congenital cases of superior rectus palsy.

Also, tipping of the head to the opposite side in superior rectus palsy may be modified by secondary deviation. In long-standing right superior rectus palsy, for instance, the right eye may fix and contracture of the contralateral yoke or synergistic muscle, the left inferior oblique, may dominate the oculo-motor picture. The left inferior oblique normally causes an outward inclination of the vertical meridian of the globe and under conditions of overaction will produce marked left extorsion. Inclination of the head to the side opposite an overacting inferior oblique, in this case to the right, will decrease torsional diplopia by producing relative left cycloversion of the two eyes.

Thus, *considerable variation in* head posture may be found in the presence of superior rectus paralysis depending on the amount and type of diplopia and on the fixing eye. If the non-paretic eye fixes the chin is elevated, the face turned to the ipsolateral side, and the head tipped to the contralateral shoulder. On the other hand, if the paretic eye fixes, the chin is raised, while the face is turned to the paralytic side, and the head tipped to the shoulder of the paralytic side. When ocular torticollis is the predominating feature, the latter condition usually prevails.

Paralysis of the Superior Oblique. — In superior oblique palsy, the muscle, which normally would cause depression, abduction and intorsion, permits the eye to be elevated, adducted and extorted. Since torsion is the predominating action of the muscle, torsional diplopia due to the outward inclination of the corneal meridian is the predominant symptom in the paralysis. It is most annoying since the images are seldom sufficiently separated one from the other to permit easy suppression. In paralysis of a right superior oblique, for example, the extorsion of the right eye can be overcome largely by tipping the head toward the left or contralateral shoulder, producing relative right cycloversion of the two eyes. In addition, the vertical separation of the images, due to right hypertropia, is lessened by depressing the chin, or relatively raising the eyes in the orbits. This takes the paralyzed eye out of the field of maximum vertical action of the paralyzed muscle, that is, down and in (most annoying in reading). Also, the horizontal or crossed diplopia, caused by the exotropic component of the deviation, is minimized by turning the face to the left or normal side, causing relative right lateral version of the eyes.

Tipping of the head to the nonparalyzed side is the characteristic posture in superior oblique paralysis. If, however, the head be forcibly tipped to the paralyzed side, as in this case of right superior oblique paralysis, the ipsolateral or right superior rectus, when attempting to overcome extorsion, due to paralysis of the right superior oblique, may cause elevation of the ipsolateral or right eye (as in the Bielschowsky test).

In contrast, if an eye with a paralytic superior oblique be used for fixation (secondary deviation), tipping of the head to the ipsolateral side is the rule. For example, if the right superior oblique is paralyzed and the right eye fixes, overaction of the contralateral yoke muscle, the left inferior rectus, will be encountered. This produces left extorsion and can be overcome by tipping the head to the right shoulder, that is, by placing the eyes in left cycloversion.

Paralysis of Other Muscles.—In similar fashion, primary paralysis of the inferior rectus may be found to produce a head tilt to the normal side with turning of the face to the affected side and depression of the chin. Here, however, the head tipping is probably due more to the torsional diplopia of the overacting antagonist, the ipsolateral superior oblique, than to the effect of the paralytic inferior rectus. Paralysis of the inferior oblique is extremely rare, but when present is accompanied by tilting of the head to the ipsolateral side, elevation of the chin, and turning of the face to the normal side. Overaction of the muscle, frequently encountered and of far greater importance, has been referred to previously.

In multiple paralyses, that is, when more than one muscle is involved simultaneously, either in the same or the two eyes, the patient chooses a position allowing binocular single vision with the greatest relief to the paralyzed muscles. Head posture is of little practical help in analysis of these cases.

Differentiation Between Ocular and Ordinary Torticollis.—Vicarious head posture due to an abnormality of the ocular muscles must not be mistaken for congenital torticollis due to contracture of the sternocleidomastoid muscle. The latter is characterized by a very obvious head tilt, facial assymetry, gross contracture of the sternocleidomastoid muscle on the side of the neck to which the head is tipped, inability to straighten the head, elevation of the chin, and turning of the face to the opposite side; in addition the ocular rotations and muscle balance are within the normal. In torticollis of ocular origin, there is no cervical pathology and the head can be straightened, but in so doing, diplopia or suppression is encountered; conjugate movements of the eyes are abnormal and ocular muscle imbalance is typical.

The mechanism of the vestibular reflexes, thought to be responsible for abnormal head posture in oculo-motor paralyses, is fairly well understood, but many cases of paralysis do not fit into the accepted scheme. For example, occlusion of a paralyzed eye invariably causes head tilt to vanish, but closing the sound eye produces no such effect. On the other hand, if the paralytic eye be highly amblyopic, and no torsional diplopia experienced, the head tilt still persists. Also, the presence of head tilt, not accompanied by binocular fixation in the central field, invariably indicates that binocular vision has been present in the past and may be regained if proper surgery is applied.

In general, it can be said that abnormal postural positions are characteristic of the various oculo-motor paralyses. Tipping of the head is diagnostic of a torsional defect. Elevation or depression of the chin is a constant finding in paralysis of a vertically-acting muscle and occasionally in the case of a horizontal deviation. Rotation of the face usually accompanies a horizontal disturbance, but, because of its variability, cannot be considered as a reliable sign. Postural changes, therefore, may be regarded as adjuncts in the diagnosis of oculo-motor paralyses, but not as substitutes for other time-tested methods.

ZUSAMMENFASSUNG

Es lässt sich die allgemeine Feststellung machen, dass unnormale Körperhaltungen für die verschiedenen Augenmuskellähmungen charakteristisch sind. Vorbeugen des Kopfes ist ein diagnostisches Zeichen für eine Drehungsschädigung. Erhebung oder Senkung des Kinns geht immer mit der Lähmung eines in vertikaler Richtung wirkenden Muskels und gelegentlich mit horizontaler Abweichung einher. Die Drehung des Gesichtes begleitet gewöhnlich eine horizontale Störung, kann aber wegen ihrer Veränderlichkeit nicht als zu-

verlässiges Zeichen gelten. Demnach können Veränderungen der Körperhaltung zwar als Hilfsmittel in der Diagnose von Augenmuskellähmungen zur Verwendung kommen, ohne jedoch andere langbewährte Untersuchungsmethoden zu ersetzen.

RIASSUNTO

In genere si dice che le posizioni posturali anormali sono caratteristiche delle paralisi dei vari oculomotori. Lo scuotimento della testa è dovuto ad un difetto di torsione. L'alzarsi e l'abbassarsi del mento sono costantemente associati alla paralisi di un muscolo agente in senso verticale ed occasionalmente con una deviazione orizzontale. La rotazione della faccia di solito accompagna disturbi sul piano orizzontale ma non può essere considerato un dato patognomonico. Le modificazioni posturali tuttavia devono essere considerate come manifestazioni utili per la diagnosi delle paralisi oculari ma non possono sostituire gli altri segni classici.

RÉSUMÉ

En général on peut dire que les anomalies posturales sont charactéristiques pour les différentes paralyses oculomotoriques. L'abaissement de la tête est un signe diagnostic d'un défaut torsional. L'élévation ou dépression du menton est toujours accompgnée d'une paralyse d'un muscle d'action verticale et quelque fois d'une déviation horizontale. La rotation du visage accompagne en général un d'érangement horizontal, mais, à cause de sa variabilité on ne peut pas se fier sur ce signe. Par cela des anomalies de la posture peuvent aider dans le diagnostic d'une paralyse oculo-motorique, mais ils ne peuvent pas substituer les autres méthodes eprouvées depuis longtemps.

◆ ◆

A Scotsman, Sir William Macewen, and an Englishman, Sir Victor Horsley, were really the first surgical explorers of the brain, and around the year 1902, Harvey Cushing began to give more and more of his attention to the inside of the skull, and he gathered around him at Baltimore a team of trained assistants.

Study of tumours inside the skull led Cushing into strange company. In a circus there was a female exhibit known as the 'ugliest woman in the world' because of her coarse features, enormous jaw and frightening appearance. Visiting her in a railroad coach which was her only home. he found her surrounded by pictures of her children whom she was bravely trying to educate out of the fees paid by those who came only to laugh at her. Harvey Cushing was moved to pity at the tragedy behind the life of this creature who lived to entertain. In the course of this humiliating existence, she suffered horribly from headaches, and was nearly blind. The cause was a small tumour at the base of her skull in an organ known as the pituitary gland.

—*Williams*

Orthopedic Surgery

Denervation of the Hip Joint

LUIZ GUSTAVO WERTHEIMER, M.D., F.I.C.S.

SAO PAULO, BRAZIL

THE publications of Tavernier on the denervation of the hip joint for the treatment of arthrosis have drawn the attention of orthopedic surgeons, and the method has been used at different centers, one of which is the Orthopaedic and Traumatologic Clinic of the Faculdade de Medicina da Universidade de S. Paulo, since 1947.

In view of the unanimous reference made by the authors to the anatomic variations of articular branches in explaining the unsuccessful results of joint denervation, 124 dissections were made at the Department of Anatomy of the Faculdade de Medicina.

On the basis of this anatomic research, denervation of the hip joint for treatment of osteoarthritis was made in 50 cases.

Clinical Material. — This investigation covers 50 denervations of the hip joint in 46 patients, in 4 of whom the operation was bilateral. There were 19 male and 27 female patients. Their ages ranged from 14 to 79 years; the majority were in their sixties.

The anamneses, as well as the roentgenologic and clinical changes, were varied. All patients referred to pain of long duration (an average of eight years) treated by several conservative methods. Laboratory tests and specialized examinations revealed no abnormality or only slight deviations.

In 19 patients osteoarthritis was a primary manifestation, without evident cause; in others it was secondary to another disease, mostly osteochondritis.

Operative Technic: The crural approach was used in 34 patients and the *cruropelvic approach* in 15. In only 1 case was section of the trunk of the obturator nerve made by the pelvic approach.

For the crural approach a curved incision was made parallel to the crural arch, following a vertical course slightly inclined outward, 1 transverse fingerbreadth lateral to the tendon of the adductor longus muscle. After lateral removal of the saphenous vein and incision of the superficial aponeurosis, the pearly tendons of the adductor longus and the pectineus muscles were reached (see illustration, *A*). Between these two muscles, the divisions of the anterior branch of the obturator nerve were followed up to the external opening of the *canalis obturatorius.* Partial or total dissection of the pectineus muscle and the pubofemoral ligament on the pubis and section of the infrapubic bandelette was performed in the majority of cases.

By means of a hook, the posterior branch or trunk of the obturator nerve was detached, and one or more thin filaments running downward and outward in the direction of the hip joint, without muscular contraction, were resected (*B*).

Dissection was always continued: a layer of fat, which frequently obliterates the external opening of the channel, was removed. The channel was dissected with

---

From the Orthopedic Clinic, Faculty of Medicine of the University of Sao Paulo, Prof. F. E. Godoy Moreira, Director. Based on a thesis for the rank of Docent-Livre, Faculty of Medicine, Sao Paulo.

Submitted for publication Nov. 30, 1955.

a blunt instrument on the lateral aspect, so as to avoid hemorrhage. Under these conditions, with the hook facing the lateral aspect of the channel, a filament, if present, could be "fished out." The removal of this filament is comparable to a tooth's extraction. Thus, all filaments running downward and outward in the direction of the joint, without muscular contraction, were resected.

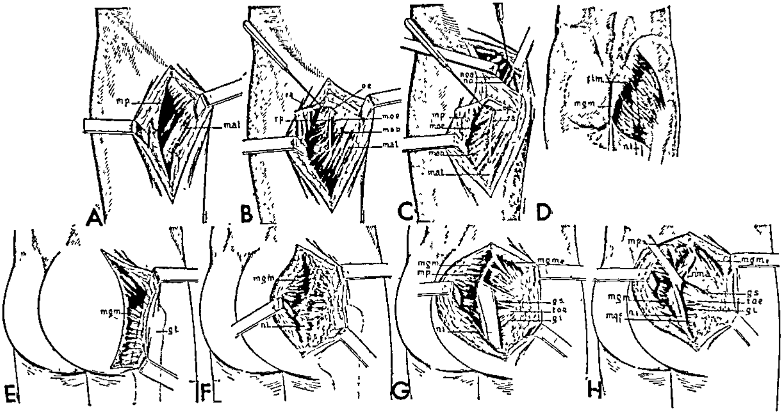
In these dissections, a great abundance of articular branches arose from the trunk of the obturator nerve in the pelvic cavity; therefore the cruropelvic approach, by which the accessory obturator nerve is also reached, was adopted. The crural approach was completed in one pelvic stage (*C*) ; through the same incision, the aponeurosis of the external oblique muscle of the abdomen was sectioned, the elements of the inguinal cord were removed; penetration into the deep opening of the inguinal channel was obtained, and through the subperitoneal space the trunk of the obturator nerve was localized with the tip of the index finger. This trunk was detached from the pelvic wall by a delicate hook, and a small twig arising from the inferior margin of the nerve trunk and penetrating into the internal orifice of the channel was resected.

Neurotomy of the Dorsal Articular Branches: A curvelinear incision was made 2 fingerbreadths medial to the greater trochanter (*D*), and the portion of aponeurosis of insertion corresponding to the superior fibers of the gluteus maximus muscle (*E*), at the level of the greater trochanter, was sectioned. This was followed by medial removal of the gluteus maximus reaching the subgluteal space (*F*) until the trunk of the ischial nerve was exposed (*G*). With the inferior outline of the major ischial foramen as a landmark, the nerve trunk was carefully detached from the subadjacent plane and the musculo-articular nerve investigated, within the boundaries established by our anatomic observations, 2.5 cm. above to 2.5 cm. below the inferior outline of this foramen. Thus the musculo-articular nerve (nerve of the inferior gemellus muscle) was observed to become detached from the anterior aspect of the trunk of the ischial nerve and, after a short, variable course of 0.3 to 4.5 cm., according to my anatomic data, deepening at the level of the cranial margin of the superior gemellus muscle (*H*). The nerve can be identified by the contraction of the inferior gemellus or the quadratic femoral muscle obtained by its excitation. By this approach it is possible to explore the trunk of the nerve upward and downward, as well as all the elements of the region. To avoid more extensive detachments, localization of the inferior outline of the major ischial foramen by the tip of the index finger is useful. When the origin of the musculo-articular nerve is high, lateral disinsertion of the pyriform muscle shows the major ischial foramen and enables one to explore the roots of the plexus, beyond the boundaries of origin of the musculo-articular nerve.

Clinical Results: In evaluating the results, the longest period of observation was six years. Eighteen cases in which there was less than a year and a half of control or in which the result was handicapped for other reasons, were excluded.

Results were considered "good" in patients who complained of little or no pain, who returned to their normal work and in whom this favorable effect was observable at least one and one-half years later. Of 32 cases the results in 19, or 59.37 per cent, were satisfactory. Two patients in these 32 cases were controlled for over five years; 4 for over four years and 7 from three to four years; 4 were observed over two years and only 2 for over one and one-half years.

As "regular" are classified the results



A, superficial aponeurosis incised and greater saphenous vein removed. Note nacreous tendon of the adductor longus muscle (*m.a.l.*) and the pectineus muscle (*m.p.*) The incision was made in the medial third of the anterior aspect of the thigh. As a point of reference, the tendons of the adductor muscles were used. *B*, space between the adductor longus and the pectineus muscle, showing the divisions of the anterior ramus of the obturator nerve, which were followed in a cranial direction. Note the superior bundles of the adductor brevis (*m.a.b.*) and the external obturator (*m.o.e.*) muscles and the posterior ramus of the obturator nerve. After the freeing of the pubic insertions of the medial pectineus fibers, the external orifice of the obturator canal is widely exposed (*o.e.*). The obturator nerve and vessels having been removed in a medial direction, careful observation reveals, next to the lateral wall of the canal, the articular branches (*r.a.*) that run downward and externally toward the joint. *C*, cruropelvic approach. For the crural operation the surgeon proceeds as aforedescribed; then, by means of the short horizontal arm of the incision, which is parallel to the crural arch, he can reach the deep orifice of the inguinal canal and through this, by way of the subperitoneal space, the stem of the obturator nerve (*n.o.*). Then, after careful removal of the iliac veins, he seeks, at the medial margin of the psoas muscle, the accessory obturator nerve (*n.o.a.; r.a.*), the anterior branch of the obturator nerve. *D*, topographic sketch of the major ischial foramen (*f.i.m.*) nerve (*n.i.*) in relation to the skeletal landmarks. E, posterior approach, showing the trochanteric portion of the aponeurosis of the gluteus maximus muscle (*m.g.m.*) at its point of insertion; this is cut near the great trochanter. The incision is made 6 to 10 cm. long and placed about 2 transverse fingerbreadths from the osseous markers (augmented for clarity). *F*, gluteus maximus muscle (*m.g.m.*) bent backward. Note the sheet of loose cellular tissue, the natural plane of cleavage between this muscle and the first inferior muscle layer. The maneuver is continued until the trunk of the ischial nerve (*n.i.*) is exposed. *G*, regional elements widely exposed: *m.p.*, pyriform muscle; *m.g.me.*, the gluteus medius; *g.s.*, the superior gemellus; *t.o.e.*, tendon of the internal obturator; *g.i.*, the inferior gemellus; *n.i.*, the ischial nerve. *H*, sketch showing how, by careful suspension of the lateral margin of the ischial nerve (*n.i.*), one sees the musculo-articular nerve (*n.m.a.*), which arises from the anterior aspect of the superior gemellus muscle (*m.g.s.*). Note also the quadratus femoris muscle (*m.q.f.*).

obtained in patients who obtained some relief of pain but are not yet rehabilitated, because pain, although slight, remains a handicap. We also placed in this category cases in which, although the improvement obtained was considerable, it was not maintained. Nine patients (28.12 per cent) were included in this group.

Finally, results were considered poor when slight improvement or none whatsoever occurred. There are 4 patients (12.50 per cent) in this group.

In 21 patients (40.62 per cent), the *articular movements* acquired greater amplitude; in 18 (46.8 per cent) they remained unchanged, with continued restriction in 12.5 per cent.

COMMENT

Some controversial features noted in the literature are taken into consideration.

Approach. — As regards the approach to the ventral branches, the authors are of different opinions, some choosing the crural approach and others the pelvic. Obviously, from the surgical point of view, the preference of any author is derived from his experience, but it is necessary to determine which approach reaches the greater number of articular branches. According to my anatomic data, the pelvic approach offers greater security if the trunk of the obturator nerve is sectioned. When simple *selective resection* of articular filaments is made, however, this approach does not have the same value. As a matter of fact, according to my observations, the filaments arise within the pelvic cavity in 40.29 per cent of cases, at the level of the internal orifice in 26.86 per cent, within the canal in 17.61 per cent and at the level of its external orifice in 14.92 per cent. Thus, by the pelvic approach the articular branches within the channel and at the level of its external orifice, i. e., 32.53 per cent, would not be reached.

On the other hand, by means of the selective resection technic, the crural approach reaches the majority of articular branches of the obturator nerve if some anatomic details are taken care of. Thus, the external orifice should be fully exposed, so as to enable one to explore the portions contiguous to the channel, with partial desinsertion of the *pectineus muscle* and, mainly, the pubofemoral ligament and the infrapubic bandelette. The trunk and terminal branches of the obturator nerve and the obturator vessels should be medially removed and the channel explored that grazes its lateral wall, in order to avoid hemorrhage.

Nevertheless our clinical results classified as satisfactory, regular and unsatisfactory occurred with approximate frequency by crural or cruropelvic approach; however, the cruropelvic approach offers more guarantee, as the accessory obturator nerve, when present, can be reached. This nerve was identified twice in 53 dissections and in 3 instances in the surgical field of 50 denervations, which is equivalent to an incidence of 4.85 per cent; in only 1 of these 5 cases were articular branches emitted to the hip.

Site of Pain. — Certain authors give greater importance *adduction contracture* as the cause of symptoms in patients with osteoarthritis of the hip joint and thus their surgical technic for its suppression is resection of the posterior branch or the trunk of the obturator nerve. Others consider the joint itself the site of origin of pain, and therefore dissect only the sensitive articular filaments.

Twenty-five of my patients referred to pain in the joint ("enchasign of the joint"), and others indicated the inguinal fold; 10 others stated that the pain radiated to the knee; 2 localized it in the large greater trochanter, and 1 stated that it was diffuse in the leg. In some instances the patients' reference to spasm was indirect, e. g., "movement was chained." Others said that the spasm was constant.

When the site of the pain was in the joint itself I preferred, whenever possible, to resect only the sensitive articular filaments, mainly in case of good joint mobility. In 15 patients, the posterior branch of the obturator nerve was resected.

Femoral nerve.—In the literature, few references to neurotomy of the branches of the femoral nerve were available. (Padovani, Papin, Fischer, Chapchal, Morin-Roasenda).

No research on the articular filaments of the femoral nerve was made in the operative field because no articular branches of this nerve were encountered in the anatomic dissections, but only slight filaments of the nerve to the pectineus, vastus lateralis, intermedialis and rectus femoralis muscles, which accompany vessels. Tavernier (1948), Mulder, Reymond, Hiertonn and Larochelie also expressed the opinion that the articular filaments of the femoral nerve have little or no importance.

Radiographic Control.—Observation of the majority of patients during a long period enables me to conduct radiographic control and to conclude with Tavernier, Padovani, Kaplan, Key and Obletz that neurotomy does not lead to neuropathic articulation.

Indications.—The earliest publications stress the palliative character of obturator neurotomy. Thus Camitz (1934) stated in his publication, the first on the subject, that this operation, accompanied by physiotherapy, "may delay invalidism." Afterward, Mol (1936) noted that "the pathologic process may not be detained but patients are made to stand longer, thus avoiding for these patients a pernicious inactivity."

Many authors who, although they do not use this technic systematically, agree in considering it useful in many circumstances, praising its simplicity of technic and operative sequence. As Reymond commented, this operation was so seductive that indications for its use were exaggerated; some started using almost routinely the denervation of every coxarthritic patient, and an enormous percentage of bad results cooled down this premature enthusiasm.

Nicod and Puechberty have made serious restrictions in the method, and Mulder excludes it as an independent operation, owing to the impossibility of selecting, from a group of patients improved by operation, those in whom a good result could be expected.

Like Mulder, in the revision of my successful cases, I was unable to find roentgenographic indications or contraindications for neurotomy. Some useful, even if not absolute data, however, may be pointed out. The majority of good results occurred in patients in whom the articular space was conserved to a certain degree, and therefore with articular cartilage. This is in accordance with the greater frequency of good results among patients with sequelae of osteochondritis. In my observations of the poor results, radiographic study showed marked narrowing of the articular space.

Poor results were also observed in patients with static disturbances, patients with pains independent of the nerve branches of the hip joint, patients with pain in the lumbar region or in the sacroiliac joint, and patients with alterations of the spine.

In our series, neurotomy was indicated for 14 elder persons with bilateral lesions; and for 9 younger patients (less than 22 years of age) in whom it was convenient to delay a definitive solution. In 8 instances the purpose of denervation was to relieve articular pain in patients with good mobility of the joint. In other cases, restrictions to osteoarticular operations in obese patients, with their sequelae — multiple fractures of the pelvis, cardiac lesions, and shortening and tilting of the pelvis. I always had in mind the fact that articular denervation is a palliative operation, as it was considered by the first authors who applied neurotomy to coxarthria. For many of these patients, the results over a relatively long period were satisfactory.

CONCLUSIONS

Of the author's series of operative patients, 59.73 per cent obtained good results; 28.12 per cent, fair results, and

12.50 per cent, bad results. The majority were followed up for three to six years, and evaluation was based mainly on the effects of the denervation on pain.

The articular movements acquired greater amplitude in 40.62 per cent of the patients, remained unaltered in 46.86 per cent and continued to be restricted in 12.5 per cent.

Roentgen control of most of the patients over a long period led the author to conclude that neurotomy of the hip does not produce osseous articular alterations of the neuropathic type. On the contrary, in some cases he noted improvement of articular lesions on roentgen examination.

It is the author's opinion that disagreements with regard to this operation are due to the exaggerated use of a procedure proposed only as a palliative measure in clinical cases of painful osteoarthritis. Bad results are also a consequence of inadequate operative technic—e.g., when one tries to do an exclusive resection of the articular twigs of the obturator nerve. There are still poor results that can be attributed only to deficient knowledge of modern articular physiopathologic concepts and of the mechanism of pain. This is the greatest objection to the procedure.

In spite of successful results and extensive indications for arthoplasty, however, there is still a place, though restricted, for palliative procedures such as denervation, which may be useful in some cases.

SCHLUSSFOLGERUNGEN

Die Krankheitsserie operierter Patienten des Verfassers wies 59,37% gute, 28,12% mässig gute und 12,5% schlechte Resultate auf. Die Mehrzahl der Kranken wurde drei bis sechs Jahre lang nachuntersucht, und die Bewertung gründete sich auf dem Einfluss der Nervenresektion auf den Schmerz.

Der Umfang der Bewegungen im Gelenk nahm in 40,62% der Kranken zu, blieb in 46,86% unverändert und verringerte sich fortgesetzt in 12,5%.

Die Mehrzahl der röntgenologischen Nachuntersuchungen, die an Kranken über einen langen Zeitraum hinaus ausgeführt wurden, liess den Verfasser zu der Schlussfolgerung kommen, dass die Nervendurchschneidung der Hüfte nicht zu Knochen-und Gelenkveränderungen neuropathischer Art führt. Im Gegenteil konnte er in manchen Fällen eine Verbesserung der knöchernen Gelenkschädigungen am Röntgenbilde beobachten.

Die hinsichtlich dieser Operation bestehenden Meinungsverschiedenheiten sind nach Ansicht des Verfassers auf die übertriebene Anwendung eines Verfahrens zurückzuführen, das als palliative Behandlung in klinischen Fällen von schmerzhafter Osteoarthritis gedacht ist. Schlechte Resultate sind auch auf unzulängliche Operationstechnik zurückzuführen, besonders bei dem Versuch, ausschliesslich die Gelenkäste des Obturatornerven zu resezieren. Ferner lassen sich auch schlechte Ergebnisse aufweisen, die nur durch unzulängliche Kenntnis der modernen Auffassung der Physiopathologie der Gelenke und des Schmerzmechanismus erklärt werden können. Hier liegen die wichtigsten Gründe für den Widerstand gegen die Operation. Trotz der Erfolge und der umfangreichen Indikationen der Gelenkplastik haben die palliativen Massnahmen wie die Entnervung des Gelenks, die in manchen Fällen nützlich sein kann, ihren wenn auch bescheidenen Platz.

CONCLUSIONI

Nella serie presentata il 59,37% degli operati ottenne risultati buoni, il 28,12 risultati discreti ed il 12,50 cattivi. La maggioranza dei malati fu seguita da 3 a 6 anni e la valutazione dei risultati venne basata sui risultati ottenuti nella cura del dolore per mezzo della denervazione. I movimenti articolari acquistarono in am-

piezza nel 40,62% dei malati, non subirono modificazioni nel 46,86 e continuarono a subire limitazioni nel 12,50%. Controlli radiologici eseguiti a distanza di tempo hanno consentito di concludere che la neurotomia dell'anca non produce alterazioni ossee o articolari di tipo neuropatico. Al contrario si può avere miglioramento delle lesioni osteo-articolari stesse. L'autore crede che la scarsa popolarità del metodo sia dovuta al suo impiego nell'osteoartrite dolorosa. Cattivi risultati si ottengono anche se la tecnica non è corretta soprattutto quando si cerca di resecare il ramo articolare del nervo otturatore. Vi sono infine cattivi risultati dovuti ad una insufficiente conoscenza della fisiopatologia e del meccanismo dei dolori articolari. Queste sono le obiezioni che vengono mosse al metodo. Ad onta dei buoni risultati e del vasto impiego della artroplastica, tuttavia, vi è ancora posto, se pur limitato, per gli interventi palliativi come la denervazione articolare che in qualche caso può essere efficace.

CONCLUSIONS

59,37% dans la série des patients opéres par l'auteur obtinrent un résultat parfait, un assez bon résultat fut obtenu à 28,12% et un mauvais résultat à 12,50%. La plupart des malades fut observée pendant 3 a 6 ans et l'évaluation fut basée sur l'effet de la dénervation sur les douleurs.

L'amplitude des mouvements articulaires devenait plus large a 40,62% des malades, ne changeait pas a 46,86% et continua d'être restreinte a 12,50%.

Les examens radiographiques qui furent continués dans la plupart des cas pendant une longue période donnaient la conclusion à l'auteur que la neurotomie de la hanche ne produit pas d'altération osseuse du type neuropathique. Au contraire, en quelques cas il observait l'amélioration des lésions osseuses à l'examen radiographique.

Dans l'opinion de l'auteur le désaccord en ce qui concerne cette opération est causé par l'emploi exagéré d'une procédure proposée comme mesure palliatif dans des cas clinicaux d'ostéoarthrite douloureuse. Des mauvais résultats sont aussi les conséquences d'une technique opératoire insuffisante, surtout si l'on essaye de faire une résection exclusive des branches articulaires du nerf obturateur. Aussi de mauvais résultats peuvent être attribués à la science insuffisante des concepts modernes de la physiopathologie articulaire et du mecanisme de la douleur. C'est l'objection principale à cette opération. Malgré les succès et les indications étendues pour l'arthroplastie, il y a encore de l'occasion, tout de même restreinte, pour les operations palliatives, comme la dénervation articulaire, qui sera utile en quelques cas.

BIBLIOGRAPHY

Camitz, H.: Die deformierende Hüftgelenkarthritis uns speziell ihre Behandlung, Acta Orthop. Scand. 4:193-213, 1933.

Hiertonn, T.: Denervation as treatment for arthrosis deformans coxae, Acta Orthop. Scand. 20:64-77, 1950.

Kaplan, E. B.: Resection of the Obturator Nerve for Relief of Pain in Arthritis of the Hip Joint, Surgery 30A:213-216, 1950.

Key, J. A., and Reynolds, F. C.: Intrapelvic Obturator Neurectomy for Relief of Chronic Arthritis of the Hip, Surgery, 24:959-967, 1948.

Larochelle, J. L.: Recherches natomiques sur l'innervation de la hanche, Laval Méd. 16:655-690, 1951.

Mol, W.: De resectie van den Nervus Obturatorius Bij Arthritis Deformans van Het Heupgewricht, Nederl. Tijds. v. Geneeskunde 9:850-855, 1935.

Mulder, J. D.: Denervation of the Hip Joint in Osteoarthritis, J. Bone & Joint Surg. 30B:446-448, 1948.

Nicod, L.: Arthrose déformante de la hanche et nerf obturateur: Indications opératoires, Rev. Med. Suisse Rom. 67:813-820, 1947.

Obletz, B. E.: Relief of Pain in Osteo-Arthritis of the Hip by Partial Denervation of the Hip Joint, Ann. Rheumat. Fis. 7:255, 1948.

Padovani, P.: Les opérations nérveuses dans le traitement de la coxarthrie, L Semaine Hôp. Paris 22:139-141,

Puerchberty, J. C.: L'énervation dans la coxarthrie. Thèse, Université de Toulouse, 1949.

Reymond, J. C.: L'énervation de la hanche dans la coxarthrie, J. de Prat. 17:583-588, 1949.

Tavernier, L.: Surgical Treatment of Degenerative Arthritis of the Hip: Articular Denervation, Rheumatism 4:56-60, 1948. (A translation.)

Wertheimer, L. G.: The Sensory Nerves of the Hip Joint, J. Bone & Joint Surg. 34A:477-487, 1952.

◆

Pettifoggers in law and quacks in medicine have held from time immemorial the fee simple of a vast estate, subject to no alienation, diminution, revolution or tax—the folly and ignorance of mankind.

—*Colton*

Nothing more strikingly betrays the credulity of mankind than does medicine. Quackery is a thing universal, and universally successful.

—*Thoreau*

He who attempts to make others believe in remedies which he himself despises, is a puffer; he who makes use of more means than he knows to be necessary, is a quack; and he who ascribes to those means a greater efficacy than his own experience warrants, is an imposter.

—*Lavater*

From powerful causes spring the empiric's profits—man's love of life, his weakness and his pains. These first induce him to try the nostrum's power, then lend his name so that others too may be cheated.

—*Crabbe*

Said a clever quack to an educated physician. "How many of the passing multitude, do you suppose, appreciate the value of science, or understand the impositions of quackery?" "Not more than one in ten," was the answer. "Well, then," said the quack, "you may have the one: I'll take the other nine."

—*Hazlitt*

Otorhinolaryngologic Surgery

Carcinoma of Larynx

BURTON J. SOBOROFF, M.D., F.A.C.S., D.A.B.

CHICAGO, ILLINOIS

TUMORS of the larynx and neck, both benign and malignant, present many problems of diagnosis and management in otolaryngologic practice. It would be very difficult in a small space to present a comprehensive review of such tumors. Many of them, however, have particular interest and importance, either because of the frequency of their occurrence or the particular difficulty in their management.

One need only mention the many types of benign tumor that may occur in the larynx. These include granulomatous masses produced by chronic infection, specific and nonspecific, as well as the less seldom encountered congenital tumors. Laryngocele is one form of congenital malformation that may lead to tumor or cyst formation, which may ultimately produce marked obstruction or a visible swelling in the neck. Papilloma, chondroma and bony tumors may also develop in the larynx. Most important is the fact that these tumors of the larynx, because of their location, may produce hoarseness and serious vocal impairment, or laryngeal obstruction resulting from progressive encroachment on the airway. Treatment of such a mass varies with the site and extent of the tumor and may be as simple as intralaryngeal surgical removal with a forceps or as complex as total laryngectomy.

Malignant tumors of the larynx continue to present many difficulties, despite the years of accumulated experience in their management. Early diagnosis has been emphasized and reemphasized, yet otolaryngologists continue to observe many more advanced carcinomas of the larynx than early ones. It is appalling to think that this state of affairs prevails with regard to a malignant growth that can be seen merely by looking for it, and in many instances can be "heard" simply by listening to the patient's speech. Patients are indeed fortunate that carcinoma in this area often makes its presence known at a very early stage. Yet, Friedberg and Wallner,[1] of this department, in reporting 31 cases of cordal carcinoma in which hoarseness was the only symptom, noted that the average duration of this symptom before diagnosis was seven months—and this length of time for a tumor whose diagnosis can be established quickly and with relative ease by biopsy!

Diagnosis may be established by direct or indirect laryngoscopic study. With the former, careful evaluation of the extent of involvement must be made to determine the most favorable form of medical or surgical management. Ayre[2] advocated the use of a brush on a long handle to obtain samples of cells from the lesion to be studied by the Papanicolaou technic.

Another aid to diagnosis is the use of the frozen section technic at the time of the initial direct laryngoscopic study and biopsy. In some cases, when considerable

---

From the Department of Otolaryngology, University of [illegible]

[illegible] ess of the United [illegible] nal College of Sur-edema is present, biopsies may give negative results, necessitating repeated procedures. Aprigliano and Torres[3] have suggested that frozen section study might be done at the time of biopsy, so that, if the tissue is not diagnostic, a second biopsy may be done immediately. This need not be carried out routinely, but it might prove helpful when difficulty is anticipated. Additional diagnostic information may be obtained by laminagraphic studies[4] of the laryngeal area. In many cases I have found it difficult or impossible to determine the subglottic extent of large lesions. Laminagrams will often demonstrate the swelling below the level of the vocal cords and its encroachment on the airway.

Interestingly, management of carcinoma of the larynx seems to be moving in diametrically opposite directions at the same time. It has been known for many years that small lesions suitable for local resection by the laryngofissure approach also respond to irradiation. Reports indicate that roentgen therapy in fractionated doses, applied by those with years of experience and technical know-how, can accomplish cure in a percentage of cases approximating that achieved by surgical therapy, and thereby assure a more satisfactory voice. The trend, therefore, in cases of very early carcinoma, is toward more conservative management.

On the other hand, many carcinomas formerly treated only palliatively by irradiation are now being managed surgically, with wide resection not only of the larynx but the pharynx and neck. These include tumors involving the supraglottic structures, the ventricle, the false cord and base of the epiglottis, the pyriform sinus or the subglottic areas, with or without palpable cervical metastases. Thus, the trend with more extensive tumors of this type is toward more radical or, preferably phrased, adequate surgical treatment.

The management of carcinoma of the larynx without distinct metastasis is dependent on a number of factors: (1) the site of involvement, (2) the extent of involvement, and (3) the pathologic classification of the growth. As has been stated, small lesions involving only the true vocal cord are amenable to laryngofissure or roentgen therapy.

In 1926, MacKenty,[5] commenting on laryngofissure, described himself as compelled "to take a most conservative attitude toward it. I would place the ban on all posterior third growths; on those in the anterior commissure crossing the midline; on rapidly growing cancers of any size or position, especially in the young; on cancers starting in the deep structures of the larynx; on growths occupying over one-third the extent of the cord in any position; on growths appearing small with incipient loss of cord function; on bilateral cancers of any size. We have for thyrotomy, therefore, middle third cord growths involving only the surface of the vocal or ventricular bands circumscribed and small in extent and of slow growth." In the light of present-day experience, of course, exceptions can be made to these hard and fast rules; nevertheless, when this is done, the risk of recurrence and the chances of failure to cure are increased. The basic concept of cancer surgery remains today exactly the same as it was in MacKenty's time—wide resection including a good margin of normal tissue, and that cannot be accomplished within the larynx with any but the smallest lesions.

In carefully selected cases a portion of the anterior commissure can also be resected by means of the Kemler technic, but, by and large, the previously mentioned concepts should be strictly applied. More extensive operation is indicated for all laryngeal lesions except those described.

Lesions involving the false cords, the ventricle and the aryepiglottic fold are best treated by laryngectomy, and in many cases, when the involvement is unilateral, combined with radical neck dissection. Subglottic lesions, likewise, are best managed by total laryngectomy, either with or without neck dissection. Studies indicate that malignant nodes are already present in a high percentage of cases in which the laryngeal lesion involves more than the true cords, even though these nodes cannot be palpated.

Ogura[6] reported an incidence of malignant though not palpable nodes in 38.3 per cent of cases of extensive laryngeal carcinoma in which neck dissection was done and the tissues thoroughly examined. Percentages varying from 30 to 50 have been reported by others. Since the incidence of malignant nodes has been observed to be so high in many series in which there was no clinical evidence of metastatic spread, neck dissection combined with laryngectomy appears to be the procedure of choice for extensive laryngeal carcinoma otherwise suitable for operation.

Needless to say, neck dissection should be combined with a wide-field laryngectomy technic. It is fortunate that the tumor in the area has developed within a distinct anatomic framework, so that there is no reason to break into the potentially involved area during the operation. The surgeon is in a position to extirpate the lesion, together with the surrounding normal tissue, and still reconstruct the pharynx in most cases. I routinely remove the hyoid bone and epiglottis above, as well as the cricoid and several tracheal rings below, to insure wide resection. When neck dissection is done, the thyroid lobe on the involved side is removed, together with the larynx, to avoid breaking into the field of spread of the tumor.

In a recent symposium on carcinoma of the larynx, Schall[7] described in some detail the steps in what he calls "block resection of the larynx." This has also been called the wide-field laryngectomy techni in contrast to a narrow-field technic or skeletonizing procedure. Unfortunately, despite the advances that have been made with such wide-field procedures, some texts published as late as 1952 still present detailed descriptions of narrow-field technics for lesions advanced enough to warrant total laryngectomy. I am convinced that any lesion with clear-cut indications for laryngectomy should be dissected by the block technic aforementioned, including the hyoid bone, the epiglottis, the strap muscles, the cricoid cartilage and several tracheal rings. This will insure a wide margin of normal tissue in those regions where local recurrence is most likely to develop. It includes the pre-epiglottic space between the hyoid bone and the upper margin of the thyroid cartilage, the cricothyroid membrane and a good margin of tissue in the subglottic region.

In a report in the *Journal of Laryngology and Otology,* Ormerod[8] reviewed the management of cancer of the larynx. He observed a certain number of local recurrences about the tracheal stoma and expressed the opinion that this might have been due to local implantation when an intratracheal tube was forced past the laryngeal lesion during the process of anesthetizing the patient. Several years ago the anesthetic technic was changed. Preliminary tracheotomy was done and anesthesia given through the tracheotomy opening, and the incidence of local recurrence about the stoma was significantly reduced. Comparable local recurrence at the line of incision has been reported as following operations on the bowel, when local resection of a segment of bowel has been done and end-to-end anastomosis accomplished. Studies have shown the presence of free tumor cells within the intestinal lumen, and implantation can occur even though resection has included a wide margin normal tissue about the localized lesio

Surgical treatment of carcinoma of the larynx is dependent on the site and extent of the lesion. Attempts must be made to correlate the results of such surgical therapy with accurate description of the laryngeal lesions, since it is difficult to compare various series of cases when such vague terms as extrinsic, intrinsic, supraglottic, endolaryngeal, etc., are used to describe the lesions. Supraglottic lesions, for example, may vary from a small lesion of the false cord area to extensive involvement of both sides of the larynx and the base of the epiglottis. If surgeons are to derive the maximum benefit from the experiences of others in the field, the sites of these lesions must be described in detail, so that the results of the therapy may be correlated with the site and extent of the lesion.

The pathologic classification of laryngeal carcinoma is another factor that must be evaluated in determining the best therapy to be applied. Anaplastic lesions have a great tendency to recur despite wide excision. Further, anaplastic or poorly differentiated epidermoid carcinoma develops more often in areas of the larynx richer in lymphatics than are the true vocal cords, so that the site of the lesion becomes a complicating factor and must be considered in evaluating the part played by the pathologic classification in the prognosis of such a tumor. Since the response of anaplastic carcinoma to irradiation is quite good and the results of surgical treatment are often disappointing, it is probably best to treat most fairly extensive undifferentiated tumors by irradiation.

The management of the patient with carcinoma of the larynx extends far beyond the decision as to the type of therapy and the choice between operation and irradiation. It includes also the management of postirradiation reaction in the mucosa and skin and postoperative management of the patient with a permanent tracheal stoma subject to the exposure of the tracheal mucosa without the protection of the upper air passages. Conley has reviewed these complications in great detail and has discussed their treatment thoroughly.[9]

In addition, treatment of cancer of the larynx includes rehabilitation of the patient who has undergone total laryngectomy. Preliminary steps in this program should be taken before the operation is done, so that the patient is adequately prepared for the procedure. He must be told not only what is to be done but the details of the training program that will follow to restore his ability to speak. Some patients will benefit a great deal by seeing other laryngectomized patients and hearing them speak. However, the best time to provide such training is often an individual matter, and may be deferred until after the operation has been performed. Most of my patients are able to learn to speak again with an esophageal voice, though their facility with such speech varies a great deal. The opportunity to learn this type of speech can be provided to all such patients, and this is an essential part of the surgeon's responsibility for their care. His efforts must be directed not only to eradication of the malignant process but to restoration of the patient to his family and his gainful occupation.

SUMMARY

Carcinoma of the larynx, which, like other malignant tumors of that organ, presents many difficulties. The author states that advanced carcinoma of the larynx is still encountered oftener than the same lesion in an early stage, despite the recent emphasis on early examination. Aids to diagnosis are direct and indirect laryngoscopic study and biopsy, the frozen section technic and laminographic study of the laryngeal area. Management in the ab-

sence of metastases depends on the site and extent of involvement and on the pathologic classification of the tumor. The surgical technics employed by the author and by other contributors to the literature are outlined.

ZUSAMMENFASSUNG

Das Kehlkopfkarzinom bietet wie andere bösartige Geschwülste dieses Organs viele Schwierigkeiten. Der Verfasser bemerkt, dass trotz neuerlicher Forderungen frühzeitiger Untersuchung der Kehlkopfkrebs im vorgeschrittenen Stadium immer noch häufiger zur Beobachtung kommt als im Anfangsstadium. Zu den diagnostischen Hilfsmitteln gehören die direkte und indirekte laryngoskopische Untersuchung, die Probeexzision, die Gefrierschnittuntersuchung und die Laminographie des Kehlkopfgebietes. Die Art der Behandlung hängt, wenn keine Metastasen vorliegen, vom Sitz und von der Ausdehnung der Erkrankung und vor der pathologischen Klassifizierung der Geschwulst ab. Es wird eine Übersicht über die vom Verfasser und anderen Autoren, die zur Literatur beigetragen haben, angewandten chirurgischen Techniken gegeben.

RÉSUMÉ

Le carcinome du larynx, comme les autres tumeurs pernicieuses de cet organe, présente de nombreuses difficultés. L'auteur déclare que le carcinome avancé du larynx est un cas encore plus fréquent que la même lésion à ses debuts bien que l'accent ait été mis récemment sur un examen précoce. Le diagnose peut être aidé par l'étude laryngoscopique directe et indirecte, la biopsie, la technique de la section gelée et l'étude laminographique de la région laryngique. En l'absence de métastases, le traitement dépend de l'emplacement et de l'étendue ainsi que de la classification pathologique de la tumeur. Les techniques chirurgicales employées par l'auteur et certains autres qui ont contribué à l'article, sont également soulignées.

REFERENCES

1. Friedberg, S. A., and Wallner, L. J.: Selected Problems in the Diagnosis of Laryngeal Carcinoma, Arch. Otol. 58:521 (Nov.) 1953.
2. Ayre, J. E.: A New Diagnostic Procedure for Carcinoma of the Larynx, J.A.M.A. 156:8 (Oct. 23) 1954.
3. Aprigliano, F., and Torres, E : Laryngoscope Frozen Section Biopsy in Peroral Endoscopy, 64: 2 (Feb.) 1954.
4. Schall, L. A.; MacMillan, A. S., and St. Aubin, P. M. G.: The Laminagram as an Aid in the Diagnosis of Diseases of the Larynx, Ann. Otol., Rhinol. & Laryngol. 62:2 (June) 1953.
5. MacKenty, J. E.: Cancer of the Larynx, Arch. Otolaryngol. 3:205, 1926.
6. Ogura, J. H.: Laryngectomy and Radical Neck Dissection for Carcinoma of the Larynx, Tr. Am. Acad. Ophthalmol. & Otolaryngol. (Nov.-Dec.) 1951.
7. Schall, L. A.: Evaluation of Total Laryngectomy, Tr. Am. Acad. Ophthalmol. & Otolaryngol. 61 (Jan.-Feb.) 1954.
8. Ormerod, F. C.: The Management of Cancer of the Larynx, J. Laryngol. and Otol. 68:1 (Jan.) 1954.
9. Conley, J. J.: The Diagnosis and Treatment of Encrustations in the Trachea, J.A.M.A. 154: 829 (March) 1954.

If, in a woman who is carrying twins, one breast becomes thin, a miscarriage will occur of one of the children. If the right breast is affected, the male child will be lost; if the left, the female.

—*Hippocrates*

Conservative Sinus Surgery

BERNARD J. RONIS, M.D., F.A.C.S., F.I.C.S.
PHILADELPHIA, PENNSYLVANIA

IT is now well established by clinical experience that, when surgical intervention becomes necessary in the treatment of chronic sinusitis, conservative measures in most cases will achieve the desired return to normal with subsidence of infection. The criteria for sinus operations established by clinicians in years past have undergone revision. These criteria have been influenced by two important factors, the advent of the antibiotics and the increasing awareness of the role played by allergy in the production and perpetuation of diseases of the respiratory tract.[1] In modern practice it is becoming less strongly indicated to employ even the conservative surgical measures; reversal of pathologic change is achieved by combined therapy directed to the infecting organisms and the allergic state.[2] In the care of acute infections of the sinuses, the fearsome complications of sinus disease are now rare. Clinical entities such as osteomyelitis of the frontal bone and the calvarium are almost never encountered. No one will doubt that this is due to the increasing number of the antibiotics, with their wide spectrum effect and their prompt employment. Failures in therapy are usually the result of mistaken diagnosis or too late use of the proper antibiotic. Not to continue the use of the drug over a sufficient period to maintain its proper effect may contribute to poor clinical results. Only in cases in which surgical drainage must be established or those in which the return to normal is not evident after continued therapy must surgical measures be considered.

The Frontal Sinus.—The treatment of frontal sinusitis and the end results thereof have been reported by many clinicians. Boies,[3] Brown,[4] and Goodyear[5] are among those who have contributed to the problem. The key to a successful end result in the care of acute or subacute frontal sinusitis is careful avoidance of the nasofrontal duct. Most observers agree that rigorous attempts at intranasal approach to the frontal sinus via the nasofrontal connections is not good therapy. The traumatic insult to an already inflamed mucosa results in continuance of the inflammatory edema, and thus drainage of the sinus is impeded. In such cases the frontal sinus rasp has been replaced by the motor-driven burr employed for trephine in the floor of the frontal sinus. The indications for this simple procedure are as follows:

1. Acute infectious frontal sinusitis that fails to respond to the local intranasal measures (vasoconstrictors employed topically in the middle meatus area, infraction of the middle turbinate, and the use of wide-spectrum antibiotics, parenterally and orally).

2. Acute exacerbations of chronic frontal sinusitis. Surgical treatment is here employed as a conservative means of care in conjunction with the use of an antibiotic determined by cultures.

3. Sudden intracranial complications occurring as the result of acute fulminating frontal sinusitis, when preliminary drainage must be established and the patient is being prepared by administration

---

Read at the Twentieth Annual Congress of the United States and Canadian Sections, International College of Surgeons, Philadelphia, Sept. 12-15, 1955.

Submitted for publication Dec. 28, 1955.

Conservative Sinus Surgery

BERNARD J. RONIS, M.D., F.A.C.S., F.I.C.S.
PHILADELPHIA, PENNSYLVANIA

It is now well established by clinical experience that, when surgical intervention becomes necessary in the treatment of chronic sinusitis, conservative measures in most cases will achieve the desired return to normal with subsidence of infection. The criteria for sinus operations established by clinicians in years past have undergone revision. These criteria have been influenced by two important factors, the advent of the antibiotics and the increasing awareness of the role played by allergy in the production and perpetuation of diseases of the respiratory tract.[1] In modern practice it is becoming less strongly indicated to employ even the conservative surgical measures; reversal of pathologic change is achieved by combined therapy directed to the infecting organisms and the allergic state.[2] In the care of acute infections of the sinuses, the fearsome complications of sinus disease are now rare. Clinical entities such as osteomyelitis of the frontal bone and the calvarium are almost never encountered. No one will doubt that this is due to the increasing number of the antibiotics, with their wide spectrum effect and their prompt employment. Failures in therapy are usually the result of mistaken diagnosis or too late use of the proper antibiotic. Not to continue the use of the drug over a sufficient period to maintain its proper effect may contribute to poor clinical results. Only in cases in which surgical drainage must be established or those in which the return to normal is not evident after continued therapy must surgical measures be considered.

The Frontal Sinus.—The treatment of frontal sinusitis and the end results thereof have been reported by many clinicians. Boies,[3] Brown,[4] and Goodyear[5] are among those who have contributed to the problem. The key to a successful end result in the care of acute or subacute frontal sinusitis is careful avoidance of the nasofrontal duct. Most observers agree that rigorous attempts at intranasal approach to the frontal sinus via the nasofrontal connections is not good therapy. The traumatic insult to an already inflamed mucosa results in continuance of the inflammatory edema, and thus drainage of the sinus is impeded. In such cases the frontal sinus rasp has been replaced by the motor-driven burr employed for trephine in the floor of the frontal sinus. The indications for this simple procedure are as follows:

1. Acute infectious frontal sinusitis that fails to respond to the local intranasal measures (vasoconstrictors employed topically in the middle meatus area, infraction of the middle turbinate, and the use of wide-spectrum antibiotics, parenterally and orally).

2. Acute exacerbations of chronic frontal sinusitis. Surgical treatment is here employed as a conservative means of care in conjunction with the use of an antibiotic determined by cultures.

3. Sudden intracranial complications occurring as the result of acute fulminating frontal sinusitis, when preliminary drainage must be established and the patient is being prepared by administration

---

Read at the Twentieth Annual Congress of the United States and Canadian Sections, International College of Surgeons, Philadelphia, Sept. 12-15, 1955.
Submitted for publication Dec. 28, 1955.

of an antibiotic before the sinuses are more extensively explored.

Trephining Technic: General or local anesthesia can be employed. Local infiltration with 1 per cent procaine and epinephrine 1:50,000 is used in either instance and is effective in controlling bleeding. With adequate preoperative sedation, local anesthesia has been preferable. The eyebrow is not shaved. The incision is made at a point just between the nasal dorsum and the inner canthus of the eye and is carried laterally just below the eyebrow to a distance of 2 or 3 cm. The incision is completed to the periosteum. A freer type of elevator is used to elevate the periosteum of the orbital roof, the supraorbital ridge being first identified at its inner half. Traction exerted by sutures placed in the everted wound margins or by small retractors will expose the denuded bone with only slight displacement of the globe. The motor-driven burr is used to enter the floor of the frontal sinus through the thin plate of bone. The opening is gradually enlarged by means *of the burr and is made large enough only* for the insertion of a No. 12 or No. 14 French catheter. In most cases pus will be seen under pressure. No suction is employed in the sinus, lest part of the sinus be denuded of mucosa. The use of the probe or curet is avoided. No attempt is made to enlarge the opening sufficiently to inspect the interior of the sinus. The chief purpose here is to establish drainage by means of the medium-sized catheter. Multiple sutures are not necessary; only one suture is placed at each end of the wound. A light dressing is applied without pressure. No attempt is made to irrigate the sinus. The usual period for retention of this catheter drainage is three to five days. In a series of 14 patients operated on by this technic, it was necessary *in only 1 instance to reinsert the* catheter for drainage because of recurrence of pain and swelling. In this case the catheter was finally removed in three days, with no further difficulty. The deformity *following the trephine operation* is practically nil in most cases. In 2 patients of this series, there was some prominence of the scar, with a tendency to keloid formation, so that subsequent excision of the scar was necessary. In 3 patients this trephine technic was employed during acute exacerbations of sinusitis after previous intranasal operations for chronic frontal sinusitis. The mucosal abnormalities observed intranasally *in these patients* was *clinically* considered due to a chronic allergy manifested by polyposis, which responded to intranasal polypectomy and attention directed to the allergic state. The end result in all patients was good, with the continued use of antibiotics and antihistaminics over prolonged periods.

When surgical exploration of the frontal sinus becomes necessary because of symptoms due to encroachment upon the *orbital cavity or other external symptoms* of mucocele, a modification of the Lynch operation has been the approach of choice. This technic does not disturb the nasofrontal duct and exposes the frontal sinus by removing only compact bone from the floor of the sinus.

Technic of Lynch Procedure: When local anesthesia is employed, 1 per cent procaine with epinephrine 1:50,000 is used to infiltrate the anterior ethmoidal area and the region in and above the skin of the floor of the frontal sinus. The eyebrow is not shaved. The incision begins at the medial aspect of the floor of the frontal sinus just below the eyebrow and extends for almost its entire length. It is carried to the periosteum with elevation of the attachment of the [illegible] *muscle ligament.* When done with the patient under general anesthesia, procaine-epinephrine infiltration will aid in maintaining hemostasis. The technic employed in trephining is now used to remove the floor of the frontal sinus. The trephine opening is gradually enlarged with a side-cutting sharp dental burr and rongeurs. Gentle suction is used to remove discharges, and in cases of pyocele a thin spatula can be used to evacuate the inspissated contents of the sac. If the mucosa is markedly hyperplastic, it can be gently stripped by means of a freer type of elevator and gauze sponges. Care is taken to avoid the nasofrontal duct depression, which can be visualized in the medial portion of the sinus floor. A No. 14 French catheter drain is used at the inner portion of the wound and sewn to the margin of the incision. The wound is then sewn tightly to the point where the catheter extrudes, and a light dressing is applied. The eye is flushed with physiologic solution of sodium chloride and left uncovered. In 11 consecutive patients operated upon by this method for mucocele or pyocele of the frontal sinus, healing was uncomplicated after removal of the catheter, which was left *in situ* for an average period of five days. Antibiotic therapy preceded the operation and was continued for twelve to fourteen days thereafter. In a series of 8 patients treated by this method for chronic frontal sinusitis, only 2 needed subsequent surgical care, with reconstruction of the nasofrontal duct. The procedure followed was the one advocated by Boyden.[6]

The Maxillary Sinus: The maxillary sinus is frequently involved by either subacute or chronic infection. In treatment, too much reliance can be placed upon antibiotic therapy, without attention to surgical drainage of the sinus. Lavage of the maxillary sinus by approach through the natural ostium or by antral puncture under the inferior turbinate will, in conjunction with the use of adequate wide-spectrum antibiotics, restore to normal most patients with subacute or chronic infections. In an analysis of 100 consecutive patients treated for maxillary sinusitis, the condition cleared with repeated lavage and antibiotics in 92. Of the 8 remaining patients in whose cases purulent discharge continued despite this conservative therapy, 5 required the naso-antral window operation. Two patients of the last-mentioned group required the Caldwell-Luc procedure, with a transantral ethmoidectomy later. Three patients had maxillary sinusitis as a sequela of dental extraction, with formation of an oro-antral fistula, and required plastic repair of the fistula and a Caldwell-Luc procedure. In 1 patient, the pathologic process involved chiefly the floor of the maxillary sinus; the remainder of the sinus mucosa appeared normal. Only the diseased portion of the mucosa was removed. In each case, the symptoms cleared with healing of the fistulous tract.

The Ethmoid Sinuses. — These sinuses make up the group most often involved with polypi occurring as part of an allergic respiratory state. In a series of 60 patients of this type, treated for clinical ethmoiditis, intranasal polypectomy was the only operation employed. Combined therapy, with study and treatment of the allergy problem and the use of antibiotics, autogenous bacterial vaccines and antihistaminics—in almost all instances resulted in longer periods of comfort for the patient without recurrence of the polyposis. In this series, in which the patients were encountered consecutively in practice, no patient required either the intranasal or the external ethmoid operation.

The Sphenoid Sinuses. — In my experience, the sphenoid sinuses have been rarely involved, except with mucosal thickening observed at roentgen examination as part of the pansinusitis associated with allergy. In this series of patients, no sphenoid operations were indicated or performed.

Consideration of surgical procedures directed to the nose in the therapy of sinusitis has been left for last. The clinical relation of the nasal septum to infectious involvement of any of the sinus groups is becoming less important. Septectomy in this series of cases was performed in 6 patients, the indication having been determined by intranasal examination. When there was a topical vasoconstrictor effect and when the middle turbinate could not be visualized on the deflected side, correction of the septum was advised. Turbinectomy as a single procedure was not carried out in any case except when the nasal septum operation was necessary and the condition that made it necessary was accompanied by compensatory hypertrophy of the middle turbinate. In these circumstances only the anterior portion of the turbinate was resected. In no case was the middle turbinate detached or removed. In 4 patients submucous resection of the inferior turbinate proved useful and was done according to the technic described by House.

SUMMARY

In the majority of patients with subacute or chronic infection of the sinuses, clinical cure can be effected by conservative measures. The role of the otolaryngologist as a surgeon is still important, but the best clinical results will be obtained by the combined use of antibiotics and modern concepts of the reversibility of tissue changes wrought by allergy. When surgical intervention is necessary, only conservative procedures should be employed first. The author presents a clinical evaluation of the end results obtained by conservative treatment in a series of patients.

ZUSAMMENFASSUNG

Die Mehrzahl der an Infektionen der Nasennebenhöhlen leidenden Kranken kann mit konservativen Massnahmen geheilt werden. Die chirurgischen Aufgaben des Hals-Nasen-Ohrenarztes sind zwar noch immer bedeutungsvoll, aber die besten klinischen Ergebnisse erhält man durch Anwendung von Antibiotika, vereint mit einer Nutzbarmachung unserer modernen Auffassungen vom Ausgleich der Gewebeveränderungen durch Behandlung allergischer Zustände. Wo ein chirurgischer Eingriff nötig ist, soll man sich zunächst mit konservativen Verfahren begnügen. Der Verfasser legt eine klinische Auswertung der Endergebnisse vor, die er bei einer Reihe von Kranken mit konservativer chirurgischer Behandlung erzielte.

RÉSUMÉ

L'auteur recommande le traitement clinique conservative pour la plupart des malades qui souffrent de l'inféction des sinus. Les méilleurs résultats son obtenus par l'usage des concepts modernes de la révérsibilité des changements dans les tissus façonnés par le ménagement des allergies.

Quand une opération est justifiée, peut (d'abord), seleument les procedures consérvatives doivent être employées.

L'auteur présente, en outre, une évaluation clinique des resultats obtenu par le traitement chirurgical.

REFERENCES

1. Hansel, F. K.: Clinical Allergy. St. Louis: The E. V. Mosby Company, 1953.

2. Goldman, J. L.: Bacteriologic Aid in Rhinologic Diagnosis and Treatment: Improved Criteria, Laryngoscope 62:406, 1952. Myers, D.: Sinus Surgery Today, Ear, Nose & Throat Monthly 31:355, 1952; Arch. Otolaryngol. 49:48, 1949.

3. Boises, L.: Acute Frontal Sinusitis: Trephine Operation in Selected Cases, Laryngoscope 52: 458, 1942.

4. Brown, J. M.: Frontal Sinusitis, Laryngoscope 56:115, 1946.

5. Goodyear, H. M.: Surgery of the Frontal Sinus, Laryngoscope 57:340, 1947.

6. Boyden, G. L.: Surgical Treatment of Chronic Frontal Sinusitis, Ann. Otol., Rhinol. & Laryngol. 61:558, 1952.

Another very interesting disease yielded up its last secret when the electrocardiograph was employed. This disease was described more than a century before by a famous Italian physician, Giovanni Morgagni, who told of his old friend, a priest, who suffered from "epilepsy and a slow pulse." The worthy priest, we are informed, had frequent attacks of unconsciousness, often with epileptic seizures, and during these attacks the pulse was remarkably slow. Later, Robert Adams and William Stokes, two Irish physicians, described this same peculiar illness and gave their name to it, but no one had any idea of its cause.

In 1905 Wilhelm His, a German anatomist, made a discovery which shed an entirely new light upon the structure of the heart and upon the mechanism of its beating. He found that the auricles and the ventricles of the heart are connected by a thin bundle of muscle which begins in the auricles and, passing downwards, divides into two branches—one to the right ventricle and one to the left. This auriculo-ventricular bundle has since been known as the bundle of His.

Physiologists next found that if this bundle of His were compressed by a clamp, the auricles continued beating at their normal rate, while the ventricles slowed down until they beat only once to each two or three beats of the auricle. This suggested immediately the relationship between this "heart block," as the physiologists called it, and Stokes-Adams disease.

The electrocardiogram proved conclusively that patients with Stokes-Adams disease did have a heart block. The pictures showed that the auricles were beating two or three times more rapidly than the ventricles. The bundle of His was "blocked," so that only every second or third contraction of the auricle sent its impulse through to the ventricle.

—*Major*

Plastic and Reconstructive Surgery

The Present Status of Rhytidoplasty

D. McCULLAGH MAYER, M.D., D.D.S., F.A.C.S., F.I.C.S.
AND
WILSON A. SWANKER, M.D., F.A.C.S., A.I.C.S.
NEW YORK CITY, NEW YORK

THE rapidly increasing proportion of elderly persons in the population poses many problems which the sociologic code has not been changed to accept. Most of these persons are not ready or willing to retire from business or social activities. Much of the human concept of aging is based on appearance—if one looks old, one must be old. Obviously, everyone is much concerned with the personal aspects of aging, particularly of changes in appearance. As there is no Fountain of Youth, he must look elsewhere. There is no organ that advertises the inexorable progress of aging more noticeably and quickly than does the skin. Wrinkles, baldness and graying signify age even to a child. Little can be accomplished in the relief of baldness, beyond the wearing of a toupee. Gray hair, of course, can be dyed any color; wrinkles of the skin must be minimized. The only method known today is surgical correction, and, although this procedure may achieve a gratifying result, the result is not permanent.

Unfortunately, such operations are relegated to the category of purely cosmetic surgery. But are they? Is a man's or a woman's desire to maintain gainful employment a vanity? Does the desire for connubial life fall into this class? And there are other good and valid reasons for the reclamation of a youthful appearance. Most of them are involved in some psychic change in the person that makes him less likely to cope efficiently with the exigencies of normal life. The preservation of a normal appearance is important—as important as recovery from the invasion of pyogens or from an epidemiologic scourge. This return to youthfulness of appearance can be accomplished only by surgical means and in persons who are sufficiently youthful in spirit and outlook to carry the new look.

This surgical treatment compensates for the aging of the skin, which is a process of atrophic change. The subcutaneous fat is withdrawn, especially the fat pads of the cheeks. Associated with loss of fat is loss of the elasticity of the skin, which thins out until in old age it may assume a parchment-like appearance. The glandular structures of the skin yield to atrophy also. Although the pores become enlarged, owing to relaxation of the surface and thinning of the skin, there is a marked decrease in glandular secretion, which results in dryness of the skin. Coexisting with these changes, or, perhaps, a partial cause of them, is the decrease in superficial circulation. Anatomically, there is a lessening of the numbers of anastomoses [illegible] capillaries [illegible] vessels in [illegible] radoxical [illegible] the age at [illegible] r, e.g., [illegible]

Read at the Twentieth Annual Congress of the United States and Canadian Sections, International College of Surgeons, Philadelphia, Sept. 12-15, 19[illegible]
Submitted for publication Dec. [illegible]

deep-red papules known as the angiomas of Dubrevilh. Much of the thinning of the epidermis is due to a loss of intercellular cement, or collagen. As nothing can be done medically to remedy it after this condition has occurred, a repositioning of the facial skin must be effected by tightening.

Before the turn of the century, attempts were made in Europe to support the sagging skin of the face by making two cutaneous incisions in the region of the temples. Later, a second set of incisions was made in the postauricular region. The next step in the evolution of the process was the preauricular correction of these incisions. Any of these procedures gave some temporary improvement, which persisted for six months to a year. It was not until these incisions were supplemented by extensive undermining that a more lasting effect was achieved. Such a result would last for four to six years.

The next advancement brought about the present procedure, with which one may expect a beneficial result lasting from five to ten years. This consists of multiple plication of the subcutaneous tissue with extensive undermining and skin stretching. Although each side may be treated as a separate operation, it is unwise to attempt to divide the treatment of one side into a series of procedures, though for a time this was the accepted procedure. Usually the neck area would be done first and the cheek and forehead later. It is extremely difficult to get equal tension on the parts. Some of these areas must be operated upon again, which makes for an unnecessary amount of surgical intervention.

"Face lifting" has become a term to be bantered about in beauty parlors and quasi-ethical medical establishments. It is frequently associated with the prefix "nonsurgical." The method may be exercise followed by the use of a freshening preparation, or it may be a skin-peeling procedure. If one reviews the reasons for aging, it becomes obvious that there is little hope of relief from these procedures. Some of the establishments that offer them are elaborately equipped with muscle-stimulating machines, skin-peeling equipment, etc. This type of emporium usually has secured an M.D. as an associate. Many women go for this show in a big way and spend a great deal of money, mainly because the treatment does not involve an operation and can be taken without the knowledge of their friends or relatives. When the results prove unsatisfactory, these patients are advised that theirs is a

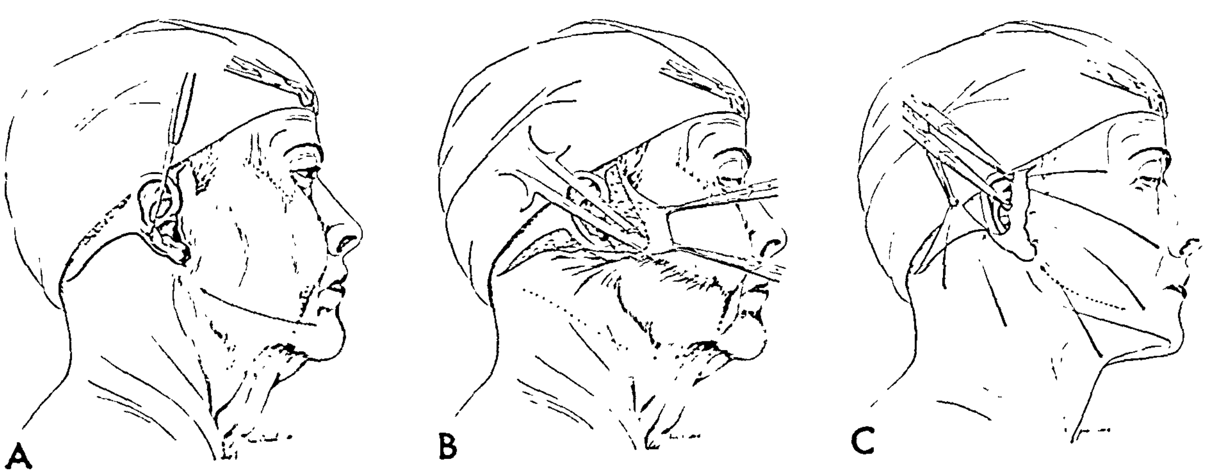


Fig. 1.—*A*, incision for rhytidoplasty. Dotted line indicates extent of undermining. *B*, undermining by semiblunt dissection. *C*, extent of skin retraction.

"particularly recalcitrant case" that will require surgical correction and that the establishment has just the surgeon who can follow through with the work, either there or at his office. The "surgeon" referred to, who is rarely accredited, may even take the patient to a proprietary hospital. The operation is usually a cutaneous excision without undermining. It is unfortunate that such a combination of faults can exist as a travesty of the really beneficial complete rhyditoplasty performed by a competent plastic surgeon.

Operative Technic. — The present-day operative procedure is as follows:

Incision: The incision is begun in the temporal region, about 2 cm. superior to the preauricular area. It is brought down to the superior meloauricular fold across the crus of the helix in the small fold that is usually present at this point, along the inner edge of the crus of the helix, into the supratragal incisure, along the inner edge of the tragus, out onto the meloauricular fold at the intertragal notch, along the fold in front of the lobe and around posteriorly, following the attachment of the lobe into the postauricular region. The incision extends cephalad just posterior to the cephalo-auricular fold up to a point horizontally opposite the upper limits of the tragus, where it curves posteriorly, in a graceful arc, onto the nape of the neck until it has reached a point about 1 cm. above the level of the ear lobe. The tip end of the incision should curve upward, as this will improve the closure. At no point along the incision should an angle occur, particularly in the posterior aspect when the incision leaves the immediate postauricular area and swings out onto the head. Exposure for the postauricular incision is improved by drawing the auricle forward with a couple of skin hooks.

Undermining: The skin is undermined through the superficial subcutaneous layers to within a short distance of the lateral canthus of the eye and along a line extending from a point near the nasolabial fold and the oral canthus. If the chin is heavy or wrinkled, the infralabial or mental region may be undermined. The neck is undermined from the submental region well down onto the neck and around to the postauricular incision. This describes the extreme limits of undermining; frequently it may be less, since it varies with the patient. The undermining may be done with a scalpel, but blunt dissection with scissors

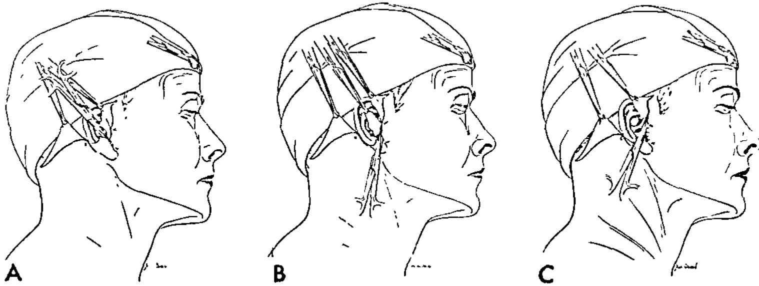


Fig. 2.—*A*, first incision for removal of redun nt skin. Note rete su in place. *B* and *C*, removal of r ntinue

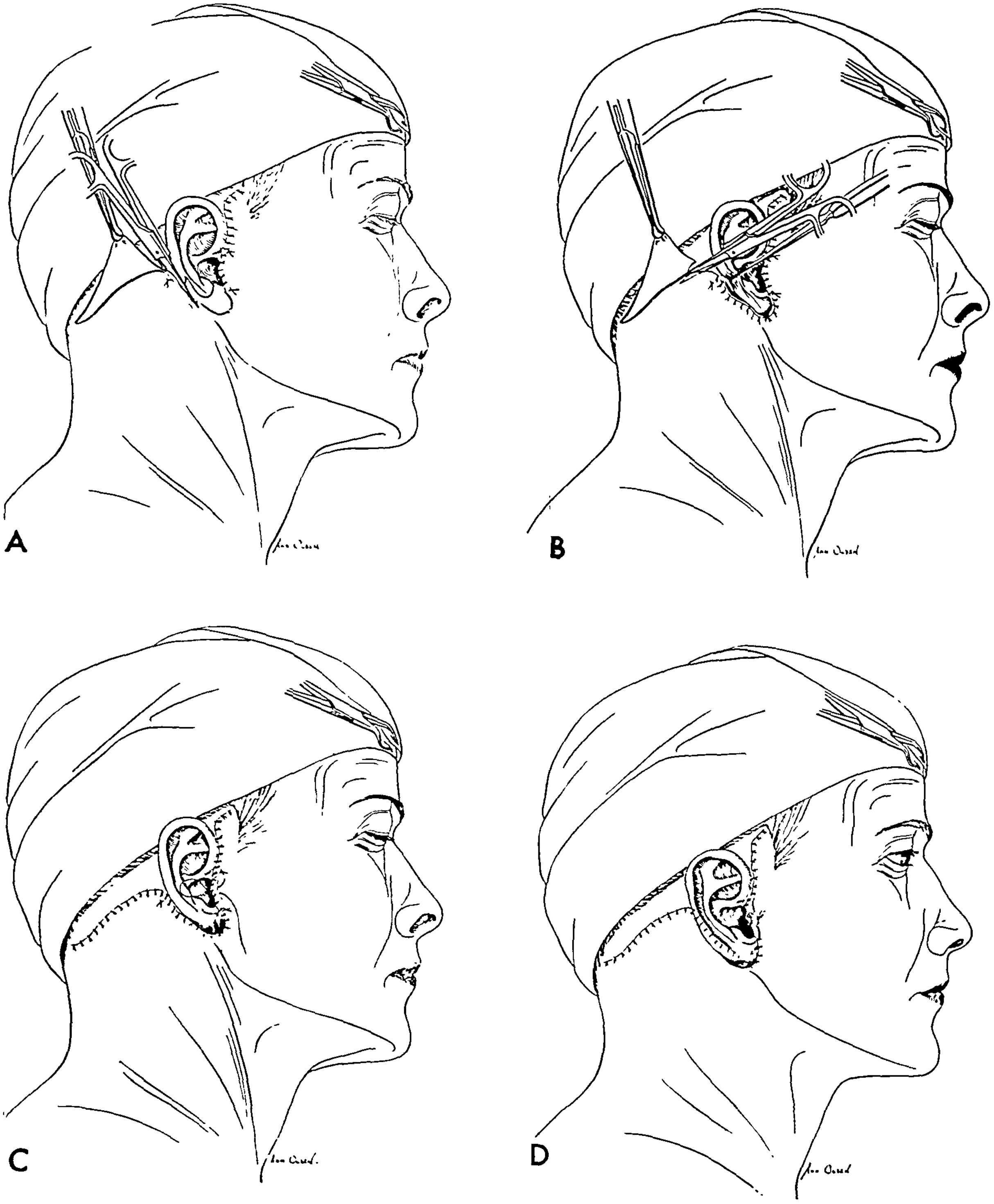


Fig. 3.—*A* and *B*, removal of redundant skin continued. *C*, incision fully sutured. Pretragal suture being inserted. *D*, operation completed.

is preferable, as there is less hemorrhage. The skin must never be split, since there is a possibility of slough whenever epidermis is pulled over areas capable of producing epidermis. The undermining is not carried deeper than the immediate subcutaneous level, since there is danger of involvement of a branch of the facial nerve. Undermining is slightly deeper under hair-bearing skin, so that the hair follicles are not injured; this applies especially to the male. If the undermining is deep, more hemorrhage will occur, because larger vessels will be opened in the deeper subcutaneous tissue. The minimal hemorrhage that occurs is controlled by wet, hot saline sponges. There is rarely any necessity for the ligation of bleeding points. If some oozing occurs, the bleeding point may be electrocoagulated. All bleeding, however, must be controlled or dangerous postoperative sequelae may occur. Accumulated blood in the neck may cause asphyxiation by pressure on the trachea. Elsewhere a blood clot is an ideal medium for a nidus of infection. Special care should be taken in the neck region over the ster*nocleidomastoid muscle, as a luxuriant* venous plexus is extremely superficial. If complete hemostasis is effected, there is no indication for the use of drains.

Stretching Technic: The freed skin is drawn backward over the auricle until the desired tension has been achieved. This is gauged by close observation of the palpebral and oral fissures. Tension may be applied until the onset of distortion at either or both of these points. No further tension is permissible. This tension is best applied by attaching two Allis clamps to the edge of the skin, one at the level of the crus of the helix and one in the postauricular region where the incision swings away from the ear. These clamps are pulled upward and backward at approximately a 60-degree angle. The angle of pull on the posterior clamp is a little greater than on the anterior clamp. At this point the auricle is nearly covered with the facial skin. An on-end mattress suture of No. 3-0 braided black silk is placed postauricularly where the incision swings out over the neck. This is the major posterior retention suture, as it maintains the cutaneous tension. A third Allis clamp is applied at the level of the intratragal notch. It is pulled upward and backward parallel to the first anterior clamp. The skin is incised with scissors from its free border anteriorly to the level of the incision at the supratragal notch. A second silk suture is placed here.

Excision of Skin: The redundant skin between the two preauricular sutures is carefully cut, the line of the original incision being followed. No further tension is applied at this point. The edges are sutured with well spaced simple sutures of No. 6-0 surgical nylon. Above this area the redundant skin takes a generally triangular shape. This is now excised again, the incision following the outline of the original one. Well spaced simple sutures of No. 6-0 surgical nylon again are used to approximate the edges.

Inferior to the previous two areas is another roughly triangular portion of skin that is to be excised. Care must be taken at the lower reaches of this excision, as the cut must pass just below the lobe of the auricle and into the postauricular area. If too much skin is removed at this point, the lobe of the auricle is apt to be pulled down out of position. Usually there is very little redundant skin to be removed in the postauricular cephalo-auricular fold. The edges are approximated with single sutures of No. 6-0 surgical nylon. It is essential to evert the skin edges carefully along the lobe in order to retain a normal ear, especially with women, since they will undoubtedly wish to wear earrings later.

An Allis clamp is now placed halfway between the posterior retention suture and the end of the original incision. The redundant skin is removed after an incision at its midpoint. The two triangles are then excised. The remaining skin edges are approximated with No. 6-0 nylon sutures.

Special Tragal Suture: At this time attention is returned to the pretragal region. At this point a through-and-through mattress suture is inserted from the skin through the tragal cartilage and the lining of the external auditory canal. The suture is tied over a small piece of gauze. This forms the normal fold usually present at this point. This suture is placed about 1 cm. from the edge of the tragal border.

Suturing: The sutures of No. 6-0 surgical nylon are placed closely along the entire incision. These are simple sutures placed so that the skin edges are slightly everted. This is accomplished by inserting the needle at an angle just to the surface of the skin. The knot is tied close to the skin on either side of the incision. The most difficult sutures are those placed along the tragus, since they are actually in the external auditory canal. The skin at this point is very friable, and care must be taken that the needle does not tear the tissues.

Dressing: The skin of the face and neck is rolled with a sponge toward the incision, to extract any blood that may have collected beneath the skin. The gauze packing is removed from the external auditory canal. The area is inspected for any blood that may have collected. A fresh gauze packing strip is placed lightly into the canal. The incision is covered with lightly impregnated petrolatum gauze or similarly impregnated gauze, such as furacin or zerofoam gauze. A folded towel is placed over the side, and the head is turned so that the other side may be operated upon. After both sides have been completed, fluffed gauze is laid over this gauze and held in place by a bandage, plain or elastic. Ice bags to the face help to control postoperative edema. The bandage is left in place for about three days. Sutures are removed at intervals of five, seven and ten days. Those which might leave suture marks are removed first, especially if there is no tension. Others may be removed less hurriedly.

There is a tautness of the face, after the swelling has subsided, which is particularly noticeable from the tenth to the fourteenth day. The swelling of the face will be present for three weeks to one month, depending upon the amount of undermining accomplished and/or the diathesis of the patient.

In closing, a word should be said of the nomenclature for this procedure. Since the operation involves correction of wrinkling of the skin of the neck, cheek and forehead, the old time meloplasty is inadequate. "Melo" is derived from the Greek *melos,* meaning limb or song. In reality the name should have been derived from the Greek stem *mela* (the cheek) if only the cheek were involved. However, in view of the fact that more of the face than the cheek is involved, a better term would be derived from the Greek stem *rhytis,* meaning a wrinkle. At the 1954 Annual Meeting of the American Society of Plastic and Reconstructive Surgery this was discussed, and the term "rhytidectomy" was given to this operation. Unfortunately this term is not correct, for the wrinkles are not excised but eradicated by the skin-stretching procedure, which is a plastic reconstruction technic. As such, it should be designated with the suffix "plasty" rather than with "ectomy." Thus, the operation should be called rhytidoplasty. The term "face lifting" should never be used, even in the vernacular, since it has been employed too often by the laity and by nonprofessional healers.

SUMMARY

The authors describe in detail a rhytidoplastic procedure for the elimination of wrinkles in the aging skin. The wrinkles are not excised but eradicated by stretching the skin after wide undermining, not only of the cheek but of the neck and forehead. The authors justify the procedure on the increased contemporary need of a lengthened period of normal social and occupational effectiveness to match the increase so widely noted in life expectancy. They object strongly to the term "face lifting," which, in their opinion, tends to spread distrust of a procedure they consider important, not only from the cosmetic but from the psychic, social and occupational points of view.

ZUSAMMENFASSUNG

Die Verfasser beschreiben ein Verfahren zur plastischen Entfernung von Runzeln der alternden Haut in seinen Einzelheiten. Die Falten werden nicht herausgeschnitten sondern durch weite Unterminierung und Streckung sowohl der Wangen- als auch der Hals- und Stirnhaut völlig beseitigt. Die Verfasser sehen die Rechtfertigung eines solchen Eingriffs in dem wachsenden Bedürfnis nach einer verlängerten Zeitspanne normaler sozialer und beruflicher Tüchtigkeit, die der allgemein bekannten Ausdehnung der Lebensdauer entspricht. Sie erheben starken Einspruch gegen die Bezeichnung des Verfahrens als "Schönheitsoperation", weil darin eine Neigung liegt, Misstrauen gegen eine Operation zu erwecken, die sie nicht nur vom kosmetischen, sondern auch vom psychologischen, gesellschaftlichen und beruflichen Standpunkt aus für wichtig halten.

RÉSUMÉ

L'auteur décrit en détail un procédé rhytidoplastique d'élimination des rides sur peaux vieillissantes. Les rides ne sont pas excisées mais effacées en tendant la peau après avoir procédé à une profonde dissection non seulement des joues, mais également du cou et du front. L'auteur justifie le procédé par le besoin croissant de prolonger la période d'efficacité normale sur les plans social et professionnel, afin de garder le pas avec les progrès constants réalisés dans la prolongation de la vie. Il s'oppose vivement au terme "relèvement du visage" (face lifting), qui, à son avis, tend à répandre une méfiance vis à vis d'un procédé qu'il considère important, non seulement du point de vue cosmétique, mais également psychique, social et professionel.

As science emerged from the dark alchemy of the Middle Ages, the assimilation of Hippocratic notions into the *corpus* of modern medicine became an easy matter because the science we know *to-day is the science of the Greeks; the facts more* numerous, but the manner of their assessment the same. So it is difficult now to say of our present practice of clinical medicine that we owe this or that to Hippocrates, while some other methods belong to someone else. Rather did Hippocrates give a shape and direction to the practice of medicine, whether it was stating the ethical standards he demanded of the practitioner, or explaining in exact argument why epilepsy is a disease due to natural causes like any other, rather than a punishment inflicted by the gods.

—*Chadwick*

Wrinkle Correction: Ear-Island Method

MARIO GONZALEZ-ULLOA, M.D.
MÉXICO D. F., MEXICO

THE world is, at present, passing through a phase unique in the history of its development: the survival of a large percentage of its population beyond the age of forty years. The census of the United States of America for the year 1950 reveals that, of a total population of one hundred and fifty-one million, fifty-three million persons have passed this conventional time line of physical decline; another thirty-four million have attained the age of fifty years; and eighteen and a half million have reached the sixty-year mark. Of this latter group, which still enjoys a life expectancy of 16.79 years, some nine million are men, and nine and a half million women.

But a marked disparity exists between the extended life span made possible by medical science and the exterior feeling of youthfulness. As evidence of this disparity, $2,415,000 is spent annually for personal care, and $1,103,000 of this sum is employed for the purpose of beautifying and to hiding the ravages of time.

Man has always searched for the secret of eternal youth—the Golden Fleece, the Fountain of Youth—and this search has at times reached the proportions of conflict, as in *Faust*.

The survival, during recent years, of this large percentage of adults has extended the period of youth beyond the age of 40 years. At present a man of 50 may live a more active and productive life than his father did at 30. But it is probable that this prolonged youth is lacking in the integral sensation of youthfulness; and it is this desire for the opportunities afforded the young, or those who appear young, the opportunity to realize an ideal, to compensate an unbalanced social, economic or emotional life, which leads to an increasing number of persons to seek the services of the plastic surgeon, to recover the equilibrium lost between the awareness of youthfulness and vitality and the outward signs of decline.

Furthermore, man lives today in a world of limited possibilities, a world in which the battle for existence is hard and unrelenting. In order to keep step in this, man's hardest march, he must be free to fight, free of handicaps and prejudices. Many of those persons who seek the services of the plastic surgeon consider it a biologic injustice that, at the precise moment in which they, through their own efforts and sacrifices, have achieved mental, physical, moral and economic maturity, the outward signs of decline become apparent, thus limiting opportunities and restricting the growth of that very new world in which they have just begun to live and develop. The period of anxiety and conflict through which these persons pass is well known to the psychiatrist. It was, in fact, this specialist who instigated the pilgrimage to the plastic surgeon, the only person truly qualified to alleviate this type of distress.

And it is for this reason, deviating somewhat from orthodox reconstructive surgery toward a more humane, and comprehensive surgery, that I describe here, for the first time, the technic I employ for the radical removal of wrinkles.

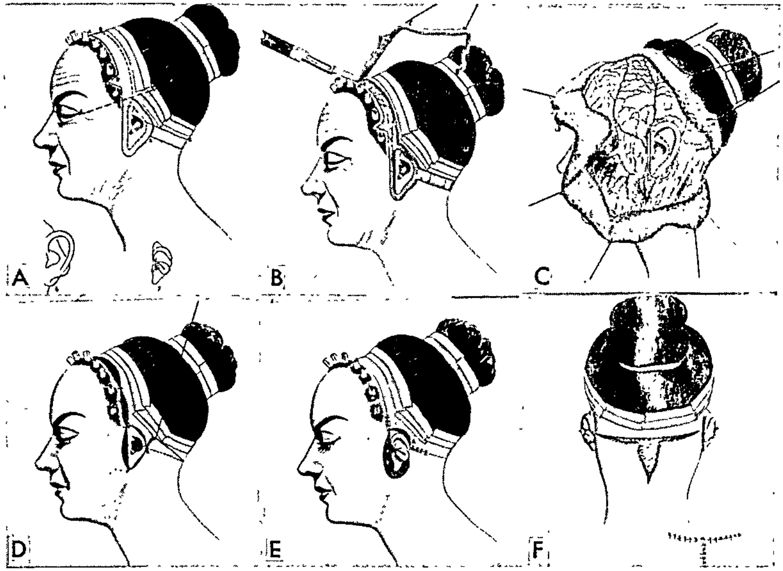


Fig. 1.—Technic of operation for correction of wrinkles (see text). *A*, tracing of lines of incision; *B*, incision begun; *C*, wide detachment of skin around "ear island"; *D*, stretching of skin; *E* and *F*, lateral and posterior views showing direction of sutures.

Principles of the Method.—The skin becomes aged owing to slackening of the trabeculas of the connective tissue, thus losing its texture and sagging in an irregular manner, the facial furrows remaining adhered and occasioning the folds that characterize age. Furthermore, the epidermis tends to become fissured, thus deepening the wrinkle line, as a result of the changes in coloration produced by the different grades of pigmentation resulting from solar radiation.

The only method now known for the correction of this defect is the return of the skin to its original position, so that it is stretched uniformly in the direction opposite that in which the folds occurred.

The methods which have been employed until now for this correction permit only manipulation of the skin in certain directions, a limitation that neither allows for adequate stretching nor restores to the face the normal appearance of youth.

In an attempt to surmount the aforementioned difficulties, a process has been evolved which unites the following advantages: (1) adequate stretching; (2) uniform tension; (3) restoration of the skin to its original position; (4) inclusion of the neck in the correction, and (5) greater duration of the operative benefits.

Procedure. — *Tracing* (Fig. 1*A*) : The line of incision is traced along the frontal region at a distance of 3 cm. behind the hair line (*a*), passing in front of t ear along the pre-auricu ow, lining the lower portion of the lobule and continuing along the edge of the retro-auricular insertion at a distance of 5 mm., thus describing a circle around the pinna and joining the pre-auricular incision.

At the level of the prolongation, and in a posterior direction from the inferior fold of the auricular fossette, a new incision is made in the occipital region and continued to meet a similar tracing on the opposite side (*c*).

Parallel to, and in front of, the first line of incision, a second line is traced (*b*) at the distance necessary to permit an adequate stretching after removal of the skin fragment enclosed within the two incisions.

As the contour of the third tracing, line *b*, is greater than that of the first, an adjustment must be made by means of four compensating triangles, two on each side (*d* and *e*) in the temporal and retro-auricular regions. It is at the latter level that such stretching of the neck as may be necessary will be effected, eliminating the excess tissue after the stretching of the anterolateral portion of the neck has been completed.

A line of tension is traced (*f-f*) from the ocular commissure outward and upward in order to calculate the desired elevation of the tissues and assure symmetry of stretching.

Incision and Detachment. — The incision (Fig. 1*B*) is initiated at one side, from the retro-auricular to the temporal region. Sectioning and detaching are done rapidly to prevent excessive hemorrhage. Only those vessels which bleed profusely should be closed off with ligatures or clamps. The anterior edges of the incision are secured by retractors, the detachment being initiated immediately and incorporating an area as extensive as the desired stretching requires. The detachment is effected with a surgical knife at the subcutaneous level, with avoidance of brusque stretching and variations of depth.

Partial incisions and detachments are effected for the purpose of avoiding the excessive hemorrhage occasioned with ordinary anesthetics.

Several pilot sutures are employed to maintain the tissues in their new position (Fig. 1*D*), and the incision is continued from the temporal to the frontal region and across to the opposite side. An extensive detachment is effected in the direction of the eyebrows and toward the posterior region (Fig. 1*C*), leaving the periosteum exposed. Once the detachment has been completed, the cutaneous edges are united by spaced sutures.

The incision is continued from the temporal region to the opposite posterior auricular area, detaching and suturing the skin being detached and sutured as aforedescribed.

Once these borders have been united, an extensive detachment is begun in the mastoid and occipital regions (Fig. 1*D*),

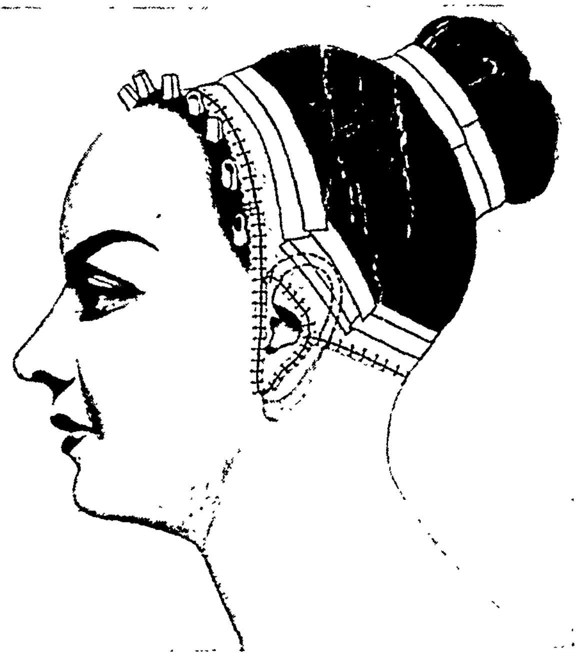


Fig. 2.—Operation completed.

permitting an excellent stretching of the lower portion of the face and the anterolateral section of the neck. A keypoint is placed in the angle to receive the total tension of the stretching (*a*, Fig. 1*D*).

The steel wire pilot sutures having been applied, the spaces between these are closed by means of fine cotton thread (No. 80) in the scalp and Dermalon (No. 5-0) in the cutaneous portion.

COMMENT

With practice, it becomes easy to calculate the desired breadth of the skin in its full extension. Error by less may be *corrected during the intervention* by means of the removal of an additional fragment of skin, this removal being equal on both sides. Error in excess must be *avoided at all cost*, but once incurred may be remedied by means of an even more extensive detachment toward the central crux of the face, and in the scalp.

The tension of the stretching should be sufficient but not excessive; experience will provide the exact measure.

The use of steel as suture material is indicated, since the tensile quality of this substance is far superior to others, and it may be used in fine threads that do not traumatize the tissues.

Aside from the large vessels that arise from the arterial stems of the aponeurosis, the majority of the vessels that bleed are within the thickness of the sectioned tissues. Hemostasis by clamp traumatizes and occasions delay; hemostasis is more effectively achieved by completion of sutures, the incision and the detachment as rapidly as possible.

SUMMARY

Pointing out the importance of retaining a youthful appearance in the modern world, in view of the greatly increased and still increasing life expectancy, the author presents a technic of eliminating the wrinkles of age by a plastic "ear-island" procedure. The technic is described in detail and is illustrated with drawings.

ZUSAMMENFASSUNG

Unter Hinweis *auf die Wichtigkeit, den* Menschen, die in der heutigen Zeit mit ständig wachsenden Aussichten auf eine grössere Lebensspanne leben, ein jugendliches Aussehen zu erhalten, unterbreitet der Verfasser eine Technik zur Beseitigung von Runzeln mittels eines plastischen "Ohreninsel"-Verfahrens. Die Technik wird in ihren Einzelheiten beschrieben und mit Zeichnungen illustriert.

RÉSUMÉ

Soulignant combien il est important, dans le monde moderne, de conserver un visage jeune, étant donné les progrès déjà réalisés et sans cesse croissants dans la *prolongation de la vie, l'auteur présente* une technique d'élimination des rides par un procédé plastique "oreille-ile" (ear-*island*). *Cette technique est décrite en* détail et illustrée de nombreux dessins.

BIBLIOGRAPHY

Bankoff, G.: New Methods of Lipectomy for Abdominal Obesity, Am. J. Surg. 80:564-567 (Nov.) 1950.

Berndorfer, A.: Esthetic Surgery; Social Indications, Orvosok Lapja 3:1324-1327 (Aug. 24) 1947.

Blocker, T. G. Jr.: Principles of Reconstruction of Defects About Face, Texas State J. Med. 42: 526-531 (Jan.) 1947.

Butler, E.: Photographic Records in Plastic Surgery, with Special Reference to Textural Aspects of Facial Portrayal, M. Press 209:109-112 (Feb. 17) 1943.

Codazzi Aguirre, J. A.: Indications for Facial *Esthetic Surgery of Guy de Chauliac: Addition to* documented history of plastic surgery in the middle ages, Cong. Latino Am. Cir. Past. 4:460-467, 1949.

Carreia, P., and Marcandes, A. de O.: Surgical Therapy of Elephantiasis of Lower Extremities; Dermolipectomy and Graft, Rev. Pauista Med. 38: 127-131 (Feb.) 1951.

Cook, T. E.: Rhytidectomy, Dallas M. J. 30:60-62 (May) 1944.

Dox, C. R.: Problems of Plastic Surgery, Wisconsin J. Med. 44:593-596 (June) 1945.

Farina, R.: Facial Rhytidectomy in Man; Case, Med. Cir. Farm., Feb.-March, pp. 151-155,

Flores, A.: Plastic Surgery; Cases, Rev. Med. Peruana 14:153-169 (May) 1942.

Galand, H.: Truth About Esthetic Surgery and Rejuvenation, Avenir Med. 45:8-11 (Jan.-Feb.) 1948.

Higley, L. B.: Facial Reconstruction and Speech, J. A. D. A. 30:1716-1725 (Nov.) 1943.

Hummel, J. G.: Cosmetic Plastic Surgery; Relationship to Personality, Ohio State M. J. 44:711-713 (July) 1948.

Ivy, R. H.: Surgery of Face, Mouth and Jaws 30 Years Ago and Now, J. Oral Surg. 1:95-99 (April) 1943.

Jackson, J. A., and Stieper, J. R.: Operative Excision of Giant Panniculus Adiposus, J. Internat. Coll. Surgeons 15:85-88 (Jan.) 19551.

King, E.: Plastic Surgery, Kentucky M. J. 40: 264-266 (July) 1942.

Lacco, J. E.: Methods of Facial Reconstruction, Philippine J. Surg. 3:179-182 (July-Aug.) 1948.

Larkin, C. L.: Lipectomy for Abdominal Fat, Connecticut M. J. 14:706-709 (Aug.) 1950.

Lolvy, R., and Duroux, P. E.: Surgical Removal from Abdominal Wall, Lyon Chir. 46:230-233 (Feb.-March) 1951.

Mayer, D. M., and Swanker, W. A.: Rhytidoplasty, Plast. & Reconst. Surg. 6:255-263 (Oct.) 1950.

McNichols, W. A.: Reconstruction Surgery of Face and Neck, Eye, Ear, Nose & Throat Monthly 28:478-483 (Oct.) 1949.

Parsons, W. H., and Purks, W. K.: Surgical Risk, Southern Surgeon 11:525-532 (July) 1942.

Quiroga, P.: Rural Esthetic Surgery, Semana Med. 2:1454-1456 (Dec. 30) 1943.

Raffaele, A. P.; Poygi, D. A., and Boses, L.: Subcutaneous Emphysema as Preliminary Stage of Lipectomy, Bol. y Trab. Soc. Argent. de Cir. 10:73-77, 1949.

Rawson, R. D.: Plastic Surgery, Dia. Med. 14: 1052-1055 (Oct. 12) 1943. Plastic Surgery Synthesis, Dia. Med. 15:638-640 (June 21) 1943.

Renie, R. O.: Economic Considerations of Cosmetic Surgery, Am. J. Surg. 55:126-130 (Jan.) 1942.

Smith, F.: Refinements in Reconstructive Surgery, J.A.M.A. 120:352-358 (Oct. 3) 1942.

Malbec, E. F.: Plastic Surgery: 5 Cases, Arq. de Cir. Clin. e Exper. Med. 6:503-512 (April-June) 1942. Pastic Surgery: 2 Cases, Semana Med. 2: 1311-1313 (Nov. 27) 1942.

Zeno, L.: Plastic Surgery, An. de cir. 8:139-151 (Sept.) 1942.

* * *

When the College of Physicians first published the Pharmacopoeia, in 1618, it was compiled, and the dedication written, by Sir Theodore Mayerne, a Frenchman, whose national vanity led him to believe, that the weight of Troyes in Champagne, must be superior to that of the *barbares* of England; not recollecting that the English weights were those used by the Greeks and Romans in composing many of the prescriptions that he had selected.

A great practical inconvenience has resulted from this French fancy, to the English apothecary, who, from that time to the present, has bought by one weight, and dispensed his medicines by another; and it is singular, that in the various alterations of the Pharmacopoeia, the College have never thought proper to alter the weights.

—*William Wadd,* circa *1827*

Proctologic Surgery

History of Cancer of the Rectum And Its Surgical Treatment

THADDEUS A. KROLICKI, M.D., F.A.C.S., F.I.C.S., D.A.B.*

PROVIDENCE, RHODE ISLAND

CANCER[1] has been known from ancient times. The usual treatments were excision and administration of a variety of escharotics, including the Egyptian arsenical ointments. Cancer is mentioned in the Papyrus Ebers from 1500 B.C. and in the oldest remnants of the literature of Persia and India.

Hippocrates, in 300 B.C., received from earlier days a considerable body of descriptive facts on cancer, including progressive malignant growths. The humoral pathologic theory then disseminated conceptions of the origin of cancer. Carcinoma has been recorded as having been burnt out, *the earliest record of diathermy.* Excision was recommended for selected cases in 30 A.D. Cato employed charcoal, while Pliny mentioned a variety of crude internal remedies.

Galen, the founder of experimental physiology and pathology, about 200 A.D., failed to make any significant advance in the concept of cancer, but his presentation of the humoral doctrine of the concentration of black bile as the cause formed a scripture that *dominated medical thought* for more than a thousand years. According to this theory, the pneuma, composed of solid parts and four fluids, blood, mucus, yellow bile and black bile, ruled the processes of the body.

Suppression of menses and hemorrhoids, preventing the discharge of black bile, were *considered chiefly responsible for* cancer, which appeared where the bile gravitated. Since capable logic could not have been lacking, one must suppose that religious and aesthetic tendencies in the race unfitted the human mind for natural thought with regard to the structure and functions of the human body. For internal cancer, of which little was known, a diet chiefly of vegetables was recommended. Walnuts were specifically forbidden.

Diagnosis rested chiefly on the cause of the disease. Treatment by excision, ligation of vessels and cauterization was comparatively successful for certain cancers. Leonides of Alexandria, in 180 A.D., broke away from the conservatism of Hippocrates and resected a cancer extensively, cutting through healthy tissues with knife and cautery—a close approach to modern technics.

From 475 to 1500 A.D., considerable progress was made *in the description* of the various tumors. Paul of Aegina,[2] in 650 A.D., suggested that, if the cancer lies where it can be grasped *in toto*, and especially if it is not fully developed, operation may be attempted, although he was never able to achieve a cure, nor did he know of anyone who [illegible] hirte [illegible]

Read at a meeting of the Philadelphia Proctologic Society, May 4, 1955.

*Fellow of the American Proctologic Society, the New England Proctologic Society, the Philadelphia Proctologic Society and the American College of Gastroenterology.

Submitted for publication Nov. 7, 1955.

teenth centuries were the Dark Ages for medicine and especially for surgery. One could study it only in private, and it was practiced only by nomads.

Lanfranchi of Lyons established scientific surgery in France with his two notable works urging radical operation for cancer with free bleeding of the affected parts. Henri de Mondeville and Guy de Chaulliac, about 1350 A.D., developed extirpation by caustic arsenic to a high degree. Chaulliac was reactionary, however, in supporting the doctrine that the healing of wounds must be accomplished more by the surgeon's constant intervention to change dressings, etc., than by the healing of nature.

In England in the time of Chaucer, surgery was not separated from medicine or from the herb lore of Saxon times. Around 1350 A.D., however, a surgeon with an original mind wrote a separate treatise on each subject, and, taken together, they presented a fairly comprehensive system of surgery. This surgeon was Johannes of Arderne,[3] and he is known as the Father of British Proctology. Learning by experimentation rather than by authority, he practiced surgical cleanliness by means of a rational asepsis, washing his hands, letting wounds heal by leaving them alone, and using methods for the control of hemorrhage that included cold, styptics and sutures. His description and practical modern treatment of *fistula in ano* earned him his apt title. Up to that time *fistula in ano* was considered incurable, as was rectal cancer. Digital examination of the anal canal and the rectum, and probing of the fistula tract, led to his selecting patients for operation at the proper time; when the inflammation subsided, his successful surgical intervention made an "incurable" disease "curable."

Although Johannes of Arderne considered cancer of the rectum incurable, his description of it is exactly that which some surgeons would give today: "The tumor is hidden from sight and can only be diagnosed by digital examination, revealing a 'hard thing as a stone,' sometimes on one side, sometimes on both, or often involving the whole circumference, and causing narrowing of the bowel. In later stages it may ulcerate externally destroying the anal canal." He gave a graphic description of a case in which there was total incontinence. He also described the frequent calls to stool that are characteristic of the disease, and the passage of "feces meddled with watery blood and stinking." In advance of his time, he was also of his time in his love of medieval lore and charm, so that "a surgeon ought not to cut or burn any member of man's body, nor do a phlebotomy while the moon is in a sign governing that member." First in a line of illustrious surgeons, he relates with characteristic frankness his failures as well as his successes.

The pre-Renaissance period was brought to an end by the paralysis accompanying the Black Death of plague and was followed by a period of regression.

The Renaissance, from 1500 to 1700 A.D., brought many new discoveries: the printing press, the circulation of the blood by Harvey in 1628, the lymph vessels by Olens in 1652, and the red blood cells by Malpighi, who had used the microscope, in 1661. Morgagni, in the early 1700's, established the importance of the anatomopathologic aspects of cancer. The construction of the achromatic microscope in 1824 opened a new era in cancer research, and various workers added to the ever-growing knowledge of the histogenetic basis of cancer.

Evolution of Surgical Procedures for Treatment of Cancer of the Rectum.—Although Littre[4] performed sigmoidostomy in 1710 and Faget amputated the rectum in 1739, the first name to become preeminent among the earlier writers because of successful extirpation of the rectum was that of Lisfranc[5] in 1826. His operation covered a circumscribed area and was limited to growths in the anal and lower rectal region. Pillore[6] of Rouen, in 1776, performed cecostomy for the relief of a rectal obstruction caused by cancer. Pring, in 1820, performed a left iliac colostomy, also for the relief of an obstruction of the rectum due to cancer. He discovered that prolapse could be prevented and the opening protected by means of a truss and pad.

From the intervals between these writings, one can see that the operation had not become a routine surgical procedure; in fact, it was regarded more or less as a heroic attempt to do the impossible—a last resort to save life.

In 1835 the first special hospital for the study of diseases of the rectum was founded in London by Frederick Salmon, and this infant establishment has grown, in the course of over a century, into St. Mark's Hospital. The first special textbook on diseases of the rectum was entitled "A Practical Treatise on Stricture of the Rectum" and was written by Frederick Salmon and published in London in 1828.

In 1839, Amussat removed the mystery from colostomy by tracing its history, proving its feasibility, and establishing its practice by using it routinely in the operating room. He contended that peritonitis, to which he attributed every fatality attendant upon this operation, could largely be avoided by the use of the lumbar colostomy, performed outside the peritoneum. As a result, Duret's procedure of lumbar colostomy[7] came into its own, and Littre's method fell into discard for nearly half a century. The popularity of lumbar colostomy was comparatively brief, however, owing to the limited working space it afforded, the occasional absence of a normal mesocolon, difficulty in finding the colon, inability to explore the abdomen, and difficulty in the proper care of the colostomy.

In 1844, Denonvilliers[8] modified Lisfranc's operation by continuing the incision to the coccyx. In the following year, Dieffenbach mobilized the rectum through an anterior and posterior incision. After resection of the rectum the upper segment was drawn down and sutured to the anus.

In the last quarter of the nineteenth century, great strides were taken, not only in this but in all forms of surgery, owing to the development of antisepsis. In 1873, Verneuil[9] extended the operative field by resecting the coccyx, extending the incision to an inch above the sacroiliac joint. Results were scarcely improved, however, the mortality rate being about 80 per cent and recurrences taking place in almost every case. For this reason the operation, even in its modified form, remained unpopular. Colostomy, although a palliative measure, was at that time the approved surgical treatment, since it prolonged the patient's life and made him more comfortable, as well as enabling him to avoid the dangers of radical operation.

There were, nevertheless, persevering surgical pioneers seeking the best treatment for this ravaging disease, and in 1875 Kocher,[10] after resection of the tumor, anastomosed the segments of the bowel, thereby retaining sphincter control, which was a decided improvement. With this improvement and the use of antiseptics the mortality rate fell to 60 per cent, with practically no change in the frequency of recurrence.

Thus the groundwork for the treatment of rectal cancer began in the nineteenth century. It was with the great advances in antisepsis, pathology and medicine in general that at the close of the nineteenth century and in the beginning of the twentieth the various modern surgical procedures were developed, and these new operations, with all their modifications, are still in use today.

Although surgical i[illegible]en[illegible] is the only definitive cure, except of certain types affected by irradiation or a combination of operation and irradiation, certain palliative measures have been used in the past with varying degrees of success or lack of success. They may be useful in certain circumstances, particularly when only palliative measures are possible. Under general medical treatment may be mentioned fresh air, sunshine, hygienic measures, pleasant environment, adequate diet, and sufficient water to prevent dehydration and accumulation of feces. Colloidal metals, carbon dioxide snow, actual cautery, electrotherapy and irradiation have all been used.

The evolution of modern surgical treatment and typical types of procedures will be described. Certain basic operations or major modifications thereof will be described in brief.

Kraske Method—Sacral Resection of the Rectum: In 1885 Kraske[11] revolutionized the treatment of rectal cancer by a method proposing wider removal for growths in the middle and upper thirds of the rectum.

Procedure: An incision is made in the midline from the second sacral vertebra to a point behind the anus, although, if the sphincters are to be sacrificed, the incision is continued around the anus. The incision is deepened and the underlying tissues are retracted, with exposure of the lower sacral segments and the coccyx. After division of the attachments of the gluteus maximus, the sacrosciatic ligaments and the coccygeus, the coccyx and sacrum below the level of the third posterior foramens on one side are removed. The rectum is exposed by division of the soft tissues down to and through the levator ani muscles, after which it is freed by blunt dissection. The peritoneum is incised to permit descent of the sigmoid, and the vessels are clamped and doubly tied. The rectum and sigmoid having been drawn down, the peritoneum is closed by suture and the bowel divided 1 inch (2.5 cm.) above and below the growth between ligatures. If it is intended to sacrifice the anal segment, the bowel is not divided below the growth but is removed *en masse.* Provided the proximal segment will reach the anus, the two ends are united; otherwise, the proximal segment is brought through and sutured in the upper angle of the wound, forming a permanent sacral anus.

This was the first real advance in radical extirpation of rectal carcinoma. The mortality rate dropped to about 20 per cent, and other contemporary surgeons, using Kraske's method, obtained even lower percentages. The rate of recurrence was lowered but remained between 70 and 80 per cent.

Although this method still has its proponents in some of the major clinics in Europe, it has become obsolete in the United States, and the abdominoperineal procedure has been substituted. The undesirable features of Kraske's operation are as follows: It carries a high recurrence rate, since it does not permit wide removal of the growth and the lymphatics; a sacral anus is more distasteful and difficult to control than is an abdominal one; prolapse of the mucosa of the sacral anus is not uncommon; discomfort frequently attends removal of the lower sacral segments; posterior fistulae are common; and, if an attempt is made to establish the continuity of the bowel, there may be nonunion at the suture line, necrosis from insufficient blood supply, and sepsis. The innumerable modifications of the Kraske operation may be divided into two categories—those which remove increasingly larger amounts of bone, and those which employ methods for the temporary reflection of portions of the sacrum as osteointegumental flaps.

Hartmann's Anterior Resection or Sigmoidectomy with Permanent Abdominal Colostomy: Sigmoidectomy with permanent abdominal colostomy was described by Hartmann[12] and a modification of it by Maurice.[13] This operation may be performed for malignant disease of the sigmoid or rectosigmoid in cases in which insurmountable technical difficulties or the condition of the patient render inadvisable any attempt to reestablish continuity of the bowel. Hartmann performed a sigmoidectomy with a permanent abdominal colostomy. He closed the rectal stump and left it below the peritonealized floor. It would appear that the operation is much safer if the stump is left above or in the peritoneal cavity.

Miles' Abdominoperineal Resection: Miles,[14] in 1908, described an abdominoperineal procedure in which the growth and all regional nodes of the pelvic floor, the perineum and the mesentery are removed. All subsequent developments have been based on the principles of this operation. Its purpose is to remove all tissues to which tumor cells may have extended by way of the three extramural lymphatic chains,[15] together with the cancerous rectum. The method consists of intra-abdominal liberation of the pelvic colon and mesocolon, the establishment of a colostomy and, finally, removal of the mobilized portions through the perineum. Although it was possible to obtain adequate removal of the dangerous tissues of the downward and lateral zones of spread by operations carried out exclusively from the perineum, the greater part of the pelvic mesocolon had to be left behind because it was beyond reach. The pelvic mesocolon is frequently the seat of metastatic deposits, so that it is important to remove it completely. The Miles operation is the only one by which the dangerous tissues of the three zones can be removed. It is a radical resection in one stage with a lower mortality rate and a higher curability rate than accompanied any operation previously described.

Mikulicz's Operation for Obstructive Resection: Mikulicz,[16] described a partial resection of the colon using the extraperitoneal principle of Paul,[17] but with the essential difference of amputating the extraperitonealized colonic loop at the time of operation.

The operation was done in several stages, with exteriorization of the intestine to be resected later, resection of the protruding loop with the tumor, conversion of an artificial anus into a fecal fistula and closure of the fecal fistula.

With this procedure the mortality rate was decreased from 42 to 12 per cent. Mikulicz's procedure was applied to the transverse and sigmoid portions of the colon. None of the operations were followed by peritonitis, which was the main cause of death after partial colectomy with primary suture. The disadvantages of the Mikulicz procedure are as follows: It requires staging; it involves a temporary colostomy; it keeps the patient a long time in bed, and in many circumstances it is not radical enough to insure complete removal of a growth and its glandular metastases. But in the presence of longstanding and marked obstruction, with considerable discrepancy in the size of the proximal and distal portions of the bowel and the urgent need to relieve the obstruction, this procedure combines relief of obstruction with removal of the tumor. In the hands of surgeons with limited experience it is a safe procedure. Primary resection with end-to-end anastomosis, however, is now the procedure of choice in most cases.

Jones' Abdominoperineal Resection; Two-Stage Procedure with Colostomy: Jones,[18] in an attempt in earlier days to avoid the high mortality rate then existing, described a two-stage procedure with colostomy. Jones' procedure enabled him to perform on patients unfit for the combined abdominoperineal operation in one stage by Mil [illegible] same extensive operation with less [illegible]ated shock. In this procedure the peritoneal cavity is entered but once, the perineal portion of the operation being entirely extraperitoneal. The disadvantages of the Jones procedure are: Convalescence is prolonged; two operations cause more discomfort than one; a double-barreled colostomy is not as satisfactory as a single-barreled one, and the healing time of the posterior sinus is prolonged because of the leakage of mucus from the distal portion beyond the colostomy.

Lahey's Two-Stage Abdominoperineal Resection with Permanent Colostomy: The Lahey procedure[19] has the advantage of permitting cleansing of the tumor-bearing segment and an opportunity for local edema and infection to subside. It has the disadvantage that it entails opening the abdomen for both the first and the second stage. Essentially this method consists of dividing the sigmoid, the upper end of which is drawn through the abdominal incision to serve as a permanent colostomy, while the lower end is brought out through a suprapubic stab wound. At the second stage the abdomen is reopened in the midline, the implanted lower end dissected free, the entire sigmoid pushed down into the pelvis and the pelvic floor closed over it. The patient is placed in the left lateral position, and the entire distal portion of the bowel is delivered through a perineal incision.

Turner-Rankin Perineoabdominal Resection, a Two-Stage Procedure with Permanent Colostomy: This procedure is applicable to cancers of the rectum and the rectosigmoid region. Turner[20] and Rankin[21] described it as a thorough exploration of the abdomen through a low midline incision and the establishment of a single-barreled colostomy.

At the second stage, an extensive dissection through the perineum is performed without opening the peritoneal cul de sac. After closure of the perineal wound, the abdomen is reopened and the diseased bowel freed and removed through the abdomen. This procedure may also be performed in one stage. It is claimed that there are certain distinct advantages.

In the first stage, when the colostomy is performed, only the small vessels are ligated, so that the blood supply of the two ends is not affected. In Rankin's opinion, less shock is encountered during the perineal phase of the second stage than through the abdominal route, and there is greater opportunity to clear out the hollow of the sacrum, ischiorectal fossa and node-bearing areas around the posterior vaginal wall in the female and the prostate and seminal vesicles in the male. On the other hand, the necessity of opening the peritoneal cavity the second time is a distinct disadvantage. The same may be said of removing the lower segment through the abdomen, which is prone to cause peritoneal contamination.

Devine's (Australia)—Radical Perineoabdominal Rectosigmoid Resection in a Functioning Bowel: This procedure was reported by Devine[22] of Australia in 1937, and it can be performed by one surgeon and an assistant or by two-surgeon teams, with a corresponding saving of time.

In this procedure the anal canal with its surrounding tissue, the rectum and the whole of the sigmoid and its mesentery are removed, and the patient is left with an inguinal artificial anus. In Devine's opinion, radicalness should be the main surgical consideration in the treatment of the invasive spreading type of carcinoma; for, in the event of a recurrence, there should be no regret that the very real danger of recurrence was subordinated to an objective of secondary importance, such as preservation of the patient's continence. This operation is based on the same principles as the Miles operation, except that it begins perineally and ends abdominally, and that practically all of the sigmoid, with its mesentery, is removed.

The advantages are that the patient is not shifted; the operation permits two surgeons to work conjointly; the incarceration of the sigmoid under the sutured peritoneum, often an operative step of some difficulty, is avoided; ligature of the sigmoid stump and protective peritoneal suture to cover the stump are avoided, and the procedure permits removal of the whole mesentery of the sigmoid. The last-mentioned advantage cannot be obtained in the abdominoperineal method, because the whole of the resected sigmoid cannot be buried under the pelvic peritoneum.

Babcock's and Bacon's Operations with Preservation of the Sphincter: The abdominoperineal resection in one stage without a colostomy has been described by Babcock[23] and Bacon[24] of Philadelphia. It is applicable to all types of cancer above the level of the middle Houston's valve, up to the rectosigmoid. It offers several advantages—the elimination of a colostomy, the omission of a perineal diaphragm, the delivery of the bowel through the perineal wound by traction on healthy rather than on diseased tissue, and the immediate formation of a perineal anus. In addition, the bowel is not crushed, opened or removed until all wounds are closed or occluded and dressings are in place.

This procedure has several modifications. It has been criticized because it fails to preserve the internal sphincter and in consequence fails to preserve continence. The Bacon procedure terminates historically the evolution of the surgical procedures for the treatment of cancer of the rectum.

Men who devote their lives and surgical skill to the development of radical technics to destroy the scourge of cancer of the rectum do so to prolong life, and are not motivated by aesthetic, sentimental, religious or other reasons. To these pioneers of the past and present and to many of those unknown to history this essay is dedicated.

SUMMARY

The history of carcinoma of the rectum and its treatment, from the earliest recognition of the entity to the present day, is sketched, with comments on the work of Hippocrates, Galen, Paul of Aegína, Leonides of Alexandria, Lanfranchi, Henri de Mondeville and Guy de Challiac of France, and the English surgeon Johannes of Arderne (John Arderne). Surgeons of the nineteenth and twentieth centuries whose work is emphasized are Littré, Amusat, Kocher, Kraske, Hartmann, Miles, Mikulicz, Jones, Lahey, Turner and Rankin, Devine, Babcock and Bacon. The technics employed by a number of these are described.

ZUSAMMENFASSUNG

Es wird ein kurzer Überblick über die Geschichte des Mastdarmkrebses und seiner Behandlung von den frühesten Tagen der Erkenntnis dieser Krankheit bis zur Gegenwart gegeben. Dabei wird auf die Werke von Hippokrates, Galen, Paulus von Aegina, Leonides von Alexandria, Lanfranchi, Henri de Mondville und Guy de Challiac aus Frankreich und des englischen Chirurgen Johannes von Arderne (John Arderne) eingegangen. Zu den Chirurgen des 19. und 20. Jahrhunderts, deren Arbeiten hervorgehoben werden, gehören Littre, Amusat, Kocher, Kraske, Hartmann, Miles, Mikulicz, Jones, Lahey, Turner und Renkin, Devine, Babcock und Bacon. Die von einigen dieser Autoren angewendeten Techniken werden beschrieben.

RÉSUMÉ

L'histoire du carcinome du rectum et son traitement, depuis qu'il a été reconnu pour la première fois jusqu'à aujourd'hui, est esquissée avec commentaires sur les

travaux d'Hippocrates, de Galen, de Paul d'Aegine, de Léonide d'Alexandrie, de Lanfranchi, d'Henri de Mondeville et Guy de Challiac (France) et du chirurgien anglais Johannes of Arderne (John Arderne). Les chirurgiens des dixneuvieme et vingtieme siècles dont les travaux sont soulignées sont: Littré, Amusat, Kocher, Krasko, Hartmann, Miles, Mikulicz, Jones, Lahey, Turner et Renkin, Devine, Babcock et Bacon. Les techniques employées par certains d'entre eux sont également décrites.

REFERENCES

1. Ewing, J.: Neoplastic Diseases: A Treatise on Tumors. Philadelphia: The W. B. Saunders Company, 1922. 2d ed.
2. Early Diagnosis and Curability of Cancer rough the Years: CA, a Bulletin of Cancer rogress (American Cancer Society) 3:5, 1953.
3. Miller, T. M.: John of Arderne, the Father of British Proctology, Proc. Roy. Soc. 47:75, 1954.
4. Littré: Mem. de l'acad. des sciences 10:36, 1710.
5. Lisfranc, J.: Memoire sur l'excision de la partie du rectum devenue carcinomateuse, Rev. med. France 2:380, 1826.
6. Pillore, H.: Brit. & Foreign M. & Chir. M. 18:452, 1776.
7. Duret, C.: Rec. periodique Soc. Med. de Paris 4:45, 1798.
8. Denonvilliers: Cancer of the Rectum, Gaz. Hop. Paris 6:283, 1884 (discussion).
9. Verneuil, A. A.: Etude sur l'extirpation de l'extremite inferieure du rectum, 1873.
10. Kocher: Cited by Hochenegg, J.: Meine Operationserfolge bei Rektumcarcinom, Wien. Klin. Wchnschr. 13:339, 1900.
11. Kraske, P.: Uber die Entstehung sekundarer Krebsgeschwulste durch Impfung, Zentralbl. Chir. 11:801, 1884.
12. Hartman, H.: Bull. et Mem. de la Soc. Chir. Paris, 12 Dec. 1923.
13. Maurice, J. A.: L'operation de Hartmann. Thése Pour le Doctoret en Medecine 8 Nov. 1944, Paris, Libraire Arnet, 1944.
14. Miles, W. E.: Operative Technic of Radical Abdomino-Perineal Operation for Cancer of the Rectum, Lancet Dec. 1908.
15. Miles, W. E.: Pathology of Spread of Cancer of Rectum and Its Bearing upon Surgery of Cancerous Rectum, Surg., Gynec. & Obst. 52:350, 1931.
16. Mikulicz-Radecki, J. V.: Chir. Erfshrung über das Darmcarcinom, Arch. klin. Chir. 69:28, 1903.
17. Paul, F. T.: Liverpool M. & Chir. J. Jan., 1895.
18. Jones, D. F.: A Two Stage Combined Abdomino-Sacral Operation for Carcinoma of the Rectum, J.A.M.A. 65:757, 1915.
19. Lahey, F. A.: Two Stage Abdominoperineal Removal of Cancer of the Rectum, Surg., Gynec. & Obst. 51:692, 1930.
20. Turner, G. G.: Relationship of Proctology to Greater Medicine, Proc. Roy. Soc. Med. 19:27, 1926.
21. Rankin, F. W.: Graded Perineo-Abdominal Resection of the Rectum and Rectosigmoid, Am. J. Surg. 27:214, 1935.
22. Devine, H.: Brit. J. Surg. 25:351, 1937.
23. Babcock, W. W.: The Operative Treatment of Carcinoma of the Rectosigmoid with Methods for Elimination of Colostomy, Surg., Gynec. & Obst. 55:627, 1932.
24. Bacon, H. E.: Evolution of Sphincter Muscle Preservation and Reestablishment of Continuity in Operative Treatment of Rectal and Sigmoid Cancer, Surg., Gynec. & Obst. 81:113, 1945.

GENERAL REFERENCES

Parker, H. E.: The Rectum and Colon. Philadelphia: Lea & Febiger, 1939.
Devine, H., and Devine, J.: The Surgery of the Colon and Rectum. Baltimore: Williams & Wilkins Company, 1948.
Bacon, H. E.: Anus-Rectum-Sigmoid-Colon: Diagnosis and Treatment. Philadelphia: The J. B. Lippincott Company. In 2 volumes. 3d ed.
Bacon, H. E., and Ross, S. T.: Atlas of Operative Technic—Anus, Rectum and Colon. St. Louis: The C. V. Mosby Company, 1954.
Christopher, F. (Ed.): A Textbook of Surgery. Philadelphia: The W. B. Saunders Company, 1954. 5th ed.
Maingot, R.: Abdominal Operations. New York: Appleton-Century-Crofts, Inc., 1955. 3d ed.

Anal Abscesses and Fistulas

WILLIAM H. RAMSEY, M.D., M.S., D.A.B.

BRYN MAWR, PENNSYLVANIA

A COMPLETE understanding of the origin and pathogenesis of anal abscesses and fistulas is absolutely essential for proper diagnosis and treatment. Anal abscesses begin with infection of one or more anal crypts. When the infection in the crypt extends into the perianal spaces an abscess results. Once the abscess has formed, a fistula is inevitable, for it exists as soon as a secondary opening is established, either by spontaneous drainage of the abscess or incision by the surgeon's knife to establish drainage. The primary opening of the fistula is always at its point of origin in the anal crypt.

Classification of Anal Abscesses.—Anal abscesses may be classified as superficial and deep. Cutaneous and subcutaneous abscesses in the perianal area are no different from the same cutaneous infections in other parts of the body. When these abscesses drain, sinuses rather than fistulas result. They do not belong in this discussion except for purposes of differential diagnosis.

The superficial anal abscess is represented by the perianal, perineal, or ischio anal abscess. The deep abscess is represented by the supra levator abscess which may be either pelvi rectal or retro rectal. Submucous abscesses of the rectum are superficial in that they occur just beneath the mucous membrane of the rectum but are deep in that they occur above the dentate margin.

Diagnosis of Anal Abscesses.—The diagnosis of a superficial anal abscess offers no difficulties. It is an acute infection in an area richly endowed with somatic sensory nerve fibers. The first symptom, therefore, is pain, which progresses as the pressure within the confines of the abscess wall increases. The other cardinal signs of inflammation are present, such as heat, redness and swelling. The inguinal glands on the involved side are often enlarged and tender. The patient is seldom acutely ill but usually feels below par and may have 1 or 2 degrees of fever.

The differential diagnosis of ischioanal abscess should not be difficult. Occasionally a perineal abscess is a periurethral abscess rather than a true anal abscess. A history of past urethritis and of recent instrumentation of the urethra should aid in differentiating the two types of abscess.

Occasionally thrombosed external hemorrhoids, prolapsing internal hemorrhoids with edema, or infection of the skin (infected comedones, sebaceous cysts, furuncles, pyoderma) will offer some diagnostic difficulties. It will help to remember that any or all of these conditions may coexist with an anal abscess. A pilonidal cyst abscess and a Bartholinian abscess will sometimes cause confusion unless they are kept in mind.

Deep or supralevator abscesses and the submucous abscesses of the rectum do not produce the exquisite pain so characteristic of the infralevator abscess. This is so because they involve, for the most part, tissues that have a visceral rather than a somatic sensory nerve supply. The patient usually complains of vague discomfort described as a full feeling and an uncomfortable feeling of pressure. In contrast to the ischioanal abscess, t [illegible] supralevator abs [illegible] oduces extr [illegible] ity. This is

---

Read at the Twentieth Annual Congress of the United States and Canadian Sections, International College of Surgeons, Philadelphia, Sept. 12-15, 1955.
Submitted for publication Sept. 21.

characterized by malaise, chills, high fever and prostration. If the abscess breaks through the levator muscle to involve the infralevator space, the patient immediately feels the excruciating pain that characterizes the ischioanal abscess.

Supralevator abscesses are diagnosed by careful digital examination of the rectum, which discloses a doughy swelling that encroaches on the rectal lumen. The swelling begins just above the pectinate line and is lateral in cases of pelvirectal and posterior in cases of retrorectal abscess. Palpation of such swellings may elicit some tenderness, but the excruciating pain of the ischioanal abscess does not develop.

Classification of Anal Fistulas. — The classification of anal fistulas is difficult because of the many possibilities. As has been stated, all abscesses become fistulas when their secondary point of drainage is established. The course of a fistula, therefore, will depend upon the nature of the abscess and the location of its secondary point of drainage.

The most common type of fistula is simple, with its primary opening in the anal crypt and its secondary opening at some point in the perianal area. Occasionally there are two or more secondary openings in the perianal area; these signify multiple branching tracts.

Complicated anal fistulas are those which have their secondary openings in unusual places, such as the vagina, the urethra or the bladder, or in the rectum above the pectinate line. The horseshoe fistula is a complicated type in which the tracts are bilateral, with one or more secondary openings on either side of the anus, but with a common source in an anal crypt, usually on the posterior wall. Other fistulas are even more complicated, such as those extending completely around the anus with branching tracts in various locations, and these defy classification.

Diagnosis of Anal Fistulas.—Any draining sinus in the vicinity of the anal canal should be looked upon as an anal fistula until proved otherwise. Whenever a true anal abscess is known to exist, the resultant channel that remains after drainage is necessarily an anal fistula. Palpation over the site of the visualized sinus opening will often disclose the tract as a firm cord leading to the anal canal; it may even be followed to the involved crypt. Inspection of the anal crypts through a well-lighted anoscope may reveal the involved crypt; and, in fact, a drop or two of pus may be seen to emerge from the crypt. This is facilitated by gentle pressure against the tract while inspection of the crypt area is being made. The use of probes to establish a connection between a cutaneous opening and an anal crypt is not only unnecessary but cruel and should be deferred until examination can be performed with the patient under anesthesia, preferably in the hospital, where the probing can be followed immediately by the appropriate surgical treatment. Inflammatory fistulous tracts can be differentiated from normal tissue by their appearance and "feel," and the use of dyes to define their extent and to help locate their connection with an anal crypt should rarely be necessary.

The differential diagnosis of anal fistulas is similar to that of anal abscesses. They must be differentiated from pilonidal sinuses and cutaneous sinuses due to penetrating injuries, such as gunshot wounds or wounds caused by impalement. Hydradenitis suppurativa of the perianal skin and fistulous tracts between the urethra and the perineal skin must be differentiated.

Treatment of Anal Abscess.—Adequate surgical drainage is the only correct treatment for anal abscess. Antibiotics should not be used in medical management in the hope of aborting the abscess and preventing its successor, the anal fistula. The time to open an anal abscess is immediately after the diagnosis has been made. This is because, in most instances, the patient has delayed reporting for treatment until the abscess has become unbearable, and by that time it is definitely ready for drainage.

Occasionally, however, a patient reports early, while his discomfort is mild and before any definite swelling is present. There is an indurated area which is tender, but all the cardinal signs of inflammation are minimal. In these circumstances it is wise to delay operation and give nature a chance to build up a protective wall about the inflamed tissue; in other words, to allow the abscess to become localized. During this period of delay, hot, moist dressings and warm sitz baths are valuable in alleviating discomfort and aiding in the localization of the abscess. As soon as the abscess has developed beyond the minimal stage, i.e., after twenty-four to seventy-two hours, it should be drained surgically. Continuing the delay in the expectation of spontaneous drainage is dangerous, for spontaneous drainage may take place in an undesirable location, thereby increasing the difficulties of the later curative operation for the resultant fistula.

Incision and drainage of an anal abscess, in order to be adequate, should consist of more than making a simple stab wound. Whenever possible, the abscess cavity should be uncapped or unroofed. This is best done in the operating room, with the patient under general or regional block anesthesia, and is accomplished by excising enough skin to make the wound as large as or almost as large as the abscess cavity itself. A running locked suture of plain No. 0 catgut may be placed around the margin of the wound if bleeding from the skin edges is brisk, but frequently no sutures are necessary. Packing of the wound is undesirable. A small rubber drain or gauze wick may be placed into the cavity, but it should be removed in twenty-four hours.

Submucous abscesses are drained by making a longitudinal incision through the rectal mucosa over the abscess cavity. The edges of the wound are then excised for partial unroofing of the cavity. A running locked suture of plain No. 0 catgut will have to be placed along the cut margins in order to control the bleeding from the mucosal edges.

Supralevator abscesses are drained without passing through the bowel wall. The incision is made lateral to the anus for the pelvirectal abscess and posterior to the anus for the retrorectal abscess. It is important to stay outside the external sphincter muscle, so as not to injure this structure. The posterior incision should be made to avoid the midline, so as not to damage the anococcygeal ligament. After the incision has been made, a closed forceps is passed through the wound and advanced until it reaches the pelvic diaphragm. It is then thrust through the diaphragm near its attachment to the anal wall. This is facilitated by placing a finger in the rectum, which acts as a guide and also helps to protect the rectal wall from injury. After the tip of the forceps has entered the abscess cavity, the instrument is opened and withdrawn. A finger can then be used to enlarge the opening further, in order to secure adequate drainage. It is obvious that a supralevator abscess cannot be uncapped in the manner described for a superficial anal abscess.

Finally, in the management of an anal abscess it should be emphasized to the patient that the surgical treatment is in the nature of an emergency, to drain the abscess, and that further surgical treatment will be necessary later as definitive therapy for cure of the resultant fistula.

Treatment of Anal Fistulas.—The interval between drainage of an anal abscess and operation for the resultant anal fistula will vary from one to several weeks. As soon as the inflammatory process has subsided and the abscess cavity has shrunk to its maximum amount, one may proceed with definitive operation. The surgical procedure is either fistulectomy, which means total extirpation of the fistulous tract, or fistulotomy, which means removal of the top and sides of the fistulous tract with its base left intact. In other words, fistulotomy is the unroofing of a fistulous tract to convert it to an open ditch.

Fistulotomy has many advantages over fistulectomy. Fistulotomy is less radical and yet, when done properly, is curative. Less sacrifice of tissue is involved and consequently less scarring. When the fistula passes through the sphincteric musculature there is less sacrifice of those sphincter muscle fibers which attach themselves to the lower portion of the fistulous tract.

In the performance of a fistulotomy it is imperative that the entire tract, together with any branching tracts, be unroofed. This is best accomplished by passing a probe through the tract, beginning at the primary opening and emerging at the secondary opening. All tissue overlying the probe is then severed until the probe lies free in the wound. The wound edges are then trimmed away in order to unroof the tract more thoroughly and also to prevent premature closing of the wound. Adequate drainage of the wound is imperative, and healing must take place slowly, beginning in the deepest portion and gradually approaching the surface. Postoperative care is important to prevent bridging, secondary infection and premature surface healing, all of which contribute to recurrence and excessive scarring with deformities.

SUMMARY

The classification, diagnosis and treatment of anal abscesses and fistulas are presented, with emphasis on the absolute necessity of a thorough understanding of these lesions if the results of treatment are to be satisfactory.

ZUSAMMENFASSUNG

Die Einteilung, Diagnostik und Behandlung von Abszessen und Fisteln des Afters werden erörtert. Dabei wird auf die unbedingte Notwendigkeit einer genauen Kenntnis dieser Erkrankungen hingewiesen, ohne die keine befriedigenden Behandlungsergebnisse erwartet werden können.

RÉSUMÉ

La classification, le diagnose et le traitement des abcès et fistules de l'anus sont présentés en insistant sur la nécessité absolue de comprendre parfaitement ces lésions si l'on désire que les résultats du traitement soient satisfaisants.

BIBLIOGRAPHY

Bacon, H. E.: Anus, Rectum, and Sigmoid Colon. Philadelphia: The J. B. Lippincott Company, 1945, pp. 191-197.

Brunsting, H. A.: Hidradenitis Suppurativa; Abscess of the Apocrine Sweat Glands, Arch. Dermat. & Syph. 39:108-120, 1939.

Buie, L. A.: Practical Proctology. Philadelphia: The W. B. Saunders Company, 1938, pp. 122-123, 127-129, 137-140.

Buie, L. A.: Anal Fistulectomy, J.A.M.A., 97: 1028-1211, 1931.

Gabriel, W. B.: The Principles and Practice of Rectal Surgery. Springfield, Ill.: Charles C Thomas, Publisher, 1948, 4th ed., pp. 160-190.

Nesselrod, J. P.: Anal, Peri anal, Perineal, and Sacro Coccygeal Sinuses, Am. J. Surg. 56:154-165, 1942.

Smith, N. D.: Common and Rare Sinuses or Fistulas Which Occur In or Near the Anus, S. Clin. North America 19:1021-1032, 1939.

Section en Francais

Les Hypotenseurs en Chirurgie

Etude comparative de 257 cas

LEOPOLD LAMBERT, M.D., F.I.C.S.,
VICTOR MONVILLE, M.D.,* ET MAURICE WILMOTTE, M.D.**
LIÈGE, BELGIQUE

NOUS avons employé les médicaments hypotenseurs dérivés de Méthonium dans 162 cas opérés à partir de 1952. La nomenclature de ces cas est détaillée dans le tableau ci-contre.

La majorité comprend des opérations pour O.R.L.

En chirurgie générale, nous avons donné ces médicaments pour des interventions sur la tête et le cou, surtout des thyroïdectomies, et aussi pour des opérations sur le sein, quelques cystocèles et quelques cas d'orthopédie.

Nous les avons abandonnés, vu leur manque d'intérê pratique, pour d'autres interventions (hystérectomies, etc.).

Nous verrons que nous pouvons diviser les cas d'emploi de sels de méthonium en deux catégories suivant le mode d'administration.

Nous avons ensuite, depuis 1954, employé exclusivement comme hypotenseur le R° 2-2222, dérivé de thiophane, spécialisé sous le nom d'Arfonad, qui nous fut généreusement fourni par la maison Roche. Nous possédons actuellement 95 fiches d'emploi de ce médicament qui nous semble beaucoup plus sûr et beaucoup plus maniable.

Bref Historique de l'Hypotension Medicamenteuse.—Paton et Zaimis, Barlow et Ing furent les premiers à préconiser l'emploi de sels de méthonium pour la réduction du saignement et l'hypotension peropératoires. Randall, Peterson et Lehman ont étudié l'Arfonad ou Ro 2-2222 du point de vue pharmacologique en 1949 dans les laboratoires Roche. Sarnoff et ses collaborateurs l'ont employé à titre thérapeutique dans l'oedème du poumon. En 1950, Organe, Davison et Enderby publient l'emploi de sels de méthonium en chirurgie. En 1951, Kern les utilise en France. Magill Scurr et Wyman publient en 1953 cinq cas d'emploi de l'Arfonad comme moyen d'hypotension en chirurgie; ils furent suivis par Nicholson, Sarnoff et Crehan (25 cas), Sadove, Wyant et Gleave (50 cas), Scurr et Wyman, Anderson et MacKissock; Kilduff (1954) s'élèvent contre l'emploi de la méthode d'administration par perfusion intraveineuse, préférant l'injection intraveineuse répétée d'Arfonad, appuyé en partie par Voorhoeve et Delahaye (Rotterdam). Clark, Bennett et Flatt publient 128 cas en 1955; Desbarax, 115 cas.

Nous nous permettons d'apporter une modeste contribution à ces travaux sur les hypotense[illegible] [illegible]liste ne [illegible]ionne d'ailleurs

---

Nous remercions les Docteurs Bonet, Delvigne, Desaive, Dubois, Dupont, Frere, G. Lambert, Massillon, Monnoyer, Quinet et Thibert, pour la comprehension qu'ils ont bien voulu nous temoigner lors de nos essais.

Nous remercions egalement les Laboratoires Roche pour l'Arfonad qu'il ont mis gracieusement a notre disposition en [illegible]:

* [illegible]

** [illegible]

2, Janvier, 1956.

Les plus fortes doses d'Arfonad données sans ennui furent celles de Scurr et Wyman (1200 mmg) Maroger et Vourch (200 mmgr en 5′ sans résultat), Vermeulen-Cranch (2400 mgr en 3 h 15) et Loew (1500 mgr d'Arfonad, plus 1500 mgr de pendiomid).

Technique d'Emploi.—1. a) Pour les 113 premiers cas d'emploi de pentaméthonium, nous fiant aux données classiques et aux indications du fabricant, nous avons donné 80 mgr (après intubation orale sous pentothal-curare). Nous continuons la narcose par N20 pento-curare ou plus souvent cyclo-curare). La chute de tension obtenue suffisait pour toute l'intervention; les réinjections chez les résistants au produit semblant inefficaces. Le malade était mis en Trendelenburg inversé, son inclinaison variait pour modifier la tension. Après l'intervention, le malade était conservé quelques heures en Trendelenburg léger.

b) Pour des raisons de sécurité accrue et de prudence, dans les 49 cas suivants d'emploi de pentaméthonium, nous injections 60 mgr suivant la même technique, nous réservant d'ajouter 20 mgr ou très rarement 40 mgr maximum si cela semblait insuffisant (ceci arriva dans 13 cas).

2. L'Arfonad s'administra dans une solution physiologique à la dilution d'1 pour 1000 (1 cm 3 = 1 mgr d'Arfonad) au rythme initial d'environ 60 gouttes minute augmenté ou diminué ensuite suivant besoin. La position du malade était la même que dans la technique précédente.

Principe d'Action.—On peut, pour comprendre l'action de ces médicaments, comparer grossièrement le malade hypotendu à une bouteille remplie à moitié de liquide et dont l'inclinaison entraîne celui-ci dans la partie déclive, vidant l'extrémité supérieure.

Plus scientifiquement, Leusen, Demeester et Vander Hauwaert ont montré que l'Arfonad avait une action vasodilatatrice directe, non corrigée par les réflexes sinocarotidiens déprimés, avec diminution du débit cardiaque dans les hypotensions prononcées. Certains autres auteurs ont invoqué une action histaminique ou une dilatation métartériolaire ou "ganglioplégique."

Les méthoniums agiraient, eux, par leur action "ganglioplégique" seule.

Indications et Contre-Indications.—Les sujets de choix sont ceu en bonne santé et d'âge moyen. Les jeunes sont plus résistants. Les hypertendus répondent par des chutes de tension spectaculaires, à des doses même minimes. Les susceptibilités à ces drogues sont strictement individuelles et indépendantes du sexe, du poids et même de l'âge (en tenant compte de notre remarque sur les hypertendus). Nous avons exclu les malades qui présentaient à l'E.C.G. des signes *nets* d'infarctus ou d'ischémie certaine du myocarde ou d'insuffisance rénale.

Resultats Obtenus.—1. a) Méthonium dose unique; b) Méthonium doses répétées. 2. Arfonad.

Doses maximum employées: 1. a) 240 mgr de C5 (échec); cas 986, homme de 32 ans, cloison (résistance à réinjections). b) 120 mgr C5 Cas 2228, homme de 40 ans, évidemment pétro-mastoïdien. 2. Arfonad 1,5 gr chez un homme de 28 ans, mastoïdectomie.

Durée maximum d'intervention: 1. a) 2 heures 15 chez homme de 22 ans; n° 1034, mastoïdectomie. b) 2 heures 30 chez femme de 23 ans, n° 3358, mastoïdectomie. 2. 2 heures 30 sous Arfonad, chez homme de 50 ans, N° 3410, pansinusite bilatérale.

Dose minimum efficace: 1. a) 20 mgr n° 1443, fistule du canal de Sténon. b) 20 mgr C5 n° 2304 cloison. 2. 25 mgr chez un homme de 56 ans, cloison.

Durée minimum: 1. a) 25′ goître n° 1936: Cloison n° 2040; Cloison n° 2098. b) 25′ cloison n° 2598 et n° 2809. 2. Homme de 16 ans. Cloison n° 3389 en 20′.

Age des patients: 1. a) De 10 ans (n°

1443 fistule du canal de Sténon) à 69 ans (cloison n° 1663). Ceci pour nos 113 premiers cas au méthonium. b) De 15 ans (N° 2295 cloison) à 62 ans (N° 3356 ablation de la moitié du maxillaire inférieur); ceci pour nos 9 derniers cas ou méthonium. 2. Pour l'Arfonad: de 15 ans (cloison n° 3377) à 77 ans (n° 3390 tumeur de la face: 200 mgr d'Arfonad en 90'.

Consequences de l'Administration d'Hypotenseurs.—1. *Peropératoires.* A. *Réaction locale:* Erythème ortié disparaîssant à l'interruption de la perfusion d'Arfonad: n° 3426, 3428 et 3432 (hypothèse d'action d'Arfonad par libération d'histamine) environ 3%. Pour les méthoniums, aucun cas.

B. *Chute de tension:* Moins nette chez les jeunes, avec parfois tachycardie, augmentée par Trendelenburg inversé, pas toujours en corrélation avec absence de saignement. 1. a) Méthonium, dose unique: pas d'effet n° 1091, 1583, 1602, 1668, 1632 et 2071, c'est-à-dire 6 cas sur 113 ou environ 5%. b) Méthonium et réinjection: peu d'effet n° 2294, 2390, 3026, 3066, soit 4 cas sur 49, ou environ 8%. 2. Arfonad, *aucun cas*, sans aucune baisse de tension; cependant, certains cas ont continué à saigner et certains ont nécessité des doses très fortes.

C. *Diminution de saignement* (échec= *non satisfaction du chirurgien)*: 1. a) Eches Nos 986, 985 (position pour Albee), 1104, N° 14 de chirurgie générale, N° 1091, 1583, 1601, 1602, 1607, 1632 (plus *décaméthonium par erreur) 1668, 1680 et* 2077, soit 11 cas sur 113 ou environ 10°/°. b) Eches: n° 2229, 2294, 2329, 2332, 2390, 2964, 3026, 3066, soit 8 cas sur 99 ou environ 15%. 2. *Arfonad:* Eches *n°* 3374 (effet tardif), 3408, 3409 (échec relatif: mauvaise absorption du CO2), 3414, 3443 (relatif) soit 5 cas sur 95 ou environ 5%.

Donc, efficacité diminuée par la 2e méthode d'administration de méthonium adoptée pour raison de sécurité, mais efficacité augmentée pour l'Arfonad.

	257 Patients	Methonium		Arfonad
		Dose unique	Dose plus faible d'essai + doses répétées	
		113 cas	49 cas	95 cas
O.R.L.	Cloisons nez	43	21	39
	Sinusites & pans.	10	9	10
	Mastoïdect. & évidements pétro-m.	4	4	6
	Curet. ethm.	0	0	1
Ophtal.	Dacryoc.	3	2	0
Chir.	Thyroïdectomies	18	8	25
	Tumeurs du cou & évidements ou ablat. de ganglions	7	1	2
	Fermet. trachéost.	*0*	*0*	1
	Parotidectomies	1	1	0
	Tumeurs & kystes max.	3	2	7
	Gl. sous-max.	1	0	0
	Fist. canal Sténon	1	0	0
	Plaie face	1	0	0
	Tumeur côte et C. cerv	1	0	1
	Greffe d'Albee	1	0	0
	Stellectomie	0	1	0
	Exérèse sein	8	0	1
	Cystocèles	2	0	1
	Hystérectomies	7	0	0
	Prostatectomie			1
	Méniscectomie			0
	Arthrodèse du pied			0

Résistance croissante à des doses ultérieures d'hypotenseurs en cas d'échec initials: 1. Totale pour les méthoniums. 2. Pour l'Arfonad, l'augmentation de la dose semble finalement avoir toujours raison de la stabilité du chiffre absolu de la tension, mais non point du saignement (cas 3374-3408-3409-3414-3443, soit environ 5%). Cette résistance pourrait être abolie, paraît-il, par les amoniums quaternaires ou la procaïnamide. Nous ne l'avons point tenté.

D. *Morts.*—1. Une syncope cardiaque avec une dose unique de pentaméthonium chez un malade à E.C.G. normal, ce qui nous fit abandonner cette technique. 2. Néant avec les doses itératives de méthonium et l'Arfonad.

2. *Post-opératoires.* — A. *Morts:* 1. a) Un cas: résection partielle de tumeur maxillaire et langue, morte trois heures après l'intervention par inhalation de sang après hémorragies, ce qui semble indépendant de l'administration du médicament. b) Néant. 2. Néant.

B. *Hémorragies:* Néant si les gros vaisseaux sont liés pendant l'opération ou si, pour les cloisons, le nez est tamponné après l'intervention. 1. a) Pas de cas d'hémorragies. b) Néant. 2. Deux cas: 3378, un hématome post-opératoire traité par incision au 4e jour, chez une thyroïdectomie où les gros vaisseaux n'avaient pas tous été liés. N° 3449, thyroïdectomie après une injection d'une demi-ampoule de méthédrine donnant un brusque hausse de pression.

C. *Céphalées:* Ne semblent exister que chez les malades dont la tension est restée basse au réveil: ce qui est une erreur de technique (traitement méthédrine ou sang).

D. *Excitation post-opératoire:* Semble une association de prédisposition, de tension insuffisamment remontée et d'anorexie cérébrale. a-b) à peu près 30%, notamment cas 1041, excitation pendant 36 heures, *et* l'état antérieur psychique semblait altéré.

E. *Transfusions nécessaires* (si la tension post-opératoire reste anormalement basse ou si le volume sanguin semble déficient) : 1. a) Six cas soit environ 5%. b) Néant. 2. Un cas (sein) soit moins d'1%.

F. *Méthédrine post-opératoire:* 1. a) Nécessaire 7 fois, soit environ 6%. b) Néant sur 49 cas. 2. 3 cas sur 95, soit environ 3%.

G. Ni *thrombose* ni *embolie* post-opératoire dans les cas étudiés.

SUMMARY

The authors used hypotensive drugs for 257 surgical operations.

A single heavy dose of methonium salts is dangerous. A lighter dose, followed by others, is no less efficacious and does not seem to be dangerous.

Arfonad is the most effective of these drugs and is apparently not dangerous.

ZUSAMMENFASSUNG

Die Verfasser haben bei 257 chirurgischen Eingriffen blutdrucksenkende Mittel angewandt. *Eine Einzeldosis von Methoniumsalzen hat sich als gefährlich erwiesen.* Eine öfters wiederholte *kleinere Dosis* ist nicht weniger wirksam und scheint ungefährlich zu sein.

Das aktivste dieser Mittel ist das *Arfonad.* Es ist offenbar nicht gefährlich.

BIBLIOGRAPHY

Randall, Peterson and Lehman: J. Pharmacol. 97:48, 1949.

Sarnoff, Goodale and Sarnoff: Circulation 6: 6399, 1952.

Sarnoff and Sarnoff: Dis. Chest 22:685, 1952.

Enderby: Lancet 1:45, 1950.

Organe: Proc. Roy. Soc. Méd. 43:181, 1950.

Davison: Lanset 1:252, 1950.

Magill, Scurr and Wyman: Lancet 1:219, 1953.

Kern: Giorn. Ital. Anest. 545, 1952.

Mathey: Mém. Acad. Chir. 78:302, 1952.

Nicholson, Sarnoff and Crehan: *Anesthésiologie* 14:215, 1953.
Sadove, Wyant and Gleave: Anaesthesia 8:175, 1953.
Scurr and Wyman: Lancet 1:338, 1954.
Anderson and MacKissock: Lancet 2:755, 1953.
Kilduff: Lancet 1:337, 1954.
Voorhoeve en Delahaye: Acta Anaesth. Belg. 483, 1953.
Voorhoeve: Der Anaesthesist. 1955, *vol.* 4.
Clark, Bennett and Flatt: Anaesthésiologie, May 5, 1955.
Desbarax: Acta Anesth. *Belgica* 6:1, 1955.
Maroger and Vourch: Anesth. et Analg. 2:642, 1954.
Vermeulen-Cranch: Nederl. Tyds. Geneesk. 98: 2363, 1954.
Loew: Der Anaesthésist 3:145, 1954.
Leusen, Demeester and Vanderhaewarts: Arch. Inst. Pharm. C 3/4, 1955.
Boyan and Brunschwigg: Surgery 31:829, 1952.
Mitchell, Newman, MacGillivray *and Clark:* Féd. Proc. 10:325, 1951.
Holman and Goth: Fed. Proc. 2:358, 1952.

Medicine, as a whole, is too vast for the grasp of any one individual. Specialism is inevitable, and having accepted it we must examine its limitations. The essential *and inescapable one is that a specialist is expert for one purpose only. A specialist* alone can be supremely efficient, and the earlier he devotes himself to a particular branch of study, the smaller that branch, and the more single-minded the devotion with which he studies it, the more efficient will he be in that branch and that alone. But disease is no specialist. Patients do not consult us because certain organs are affected, but because they feel ill. They come with symptoms, and the earlier and therefore the more curable their malady is, the more vague will those symptoms be, the more difficult the elucidation of their cause, the greater the need, in the first place, of a general investigation by one whose daily practice covers the whole of disease.

Even in the study of one disease it is doubtful if specialism necessarily leads to surgical skill of the highest order. We hear today of thyroid specialists. What is a thyroid specialist? Is he necessarily better than the non-specialist thyroidectomist? Indeed, is he often as good? Will not the surgeon accustomed to operate in all parts of the body, if he specializes in good technique, if he performs the operation for the first few times under apprenticeship and afterwards undertakes it often enough not to forget what he has learnt, do it better than the man who pursues it day after day with single-minded attention? The latter is only too likely to degenerate into that dangerous Pooh-bah, the thyroid expert — surgeon, physician, gynaecologist, psychologist, endocrinologist, physiologist, and haematologist in one.

—Ogilvie

Les Metrorragies, Signes de Thromboses Pelviennes Latentes

A. J. BRET, M.D.*

PARIS, FRANCE

SAIGNEMENT et coagulation intravasculaire qualifient deux phénomènes dont la coexistence peut paraitre anormale à première vue. Or Lian & Garcin ont rapporté en 1953 plusieurs cas de thromboses veineuses à répétition chez des malades porteurs de hernies diaphragmatiques avec hématémèse et anémie. Quenu Jacquelin et Leger en 1952 ont rapporté à Académie de Chirurgie de Paris, l'observation d'un infarctus intestinal par thrombose veineuse, traité et guéri après intervention, par les anticoagulants.

Quant aux hémorragies utérines, leur coexistence avec des lésions de thrombose se retrouve dans des publications bien plus anciennes: en 1925, Michon, Moulonguet et Blamontier rapportent l'observation d'une jeune femme qui a présenté trois mois après un avortement et pendant trois ans, des métrorragies répétées et très importantes. L'examen histologique montrait une endo-vascularite thrombosante diffuse des vaisseaux utérins, d'origine streptococcique.

En 1928, Digonnet, dans sa thèse sur les hémorragies secondaires de la puerpéralité décrit dans toutes les observations, des lésions vasculaires importantes et diffuses, en particulier une thrombose massive des vaisseaux utérins.

Mais surtout Cotte & Mathieu en 1934, attirent l'attention sur les phlébites spontanées survenant au cours de l'évolution des myomes utérins. Leur étude est centrée sur la phlébite des membres inférieurs, souvent bilatérale et à bascule, compliquée parfois d'embolie pulmonaire.

Ces auteurs signalent que Tixier, dans son rapport au "Congrès de Chirurgie" de 1924, montre l'existence de ces phlébites dans l'évolution des myomes à forme d'anémie pernicieuse. L'intérêt est de retrouver en effet dans les manifestations présentées par les 4 malades de Cotte & Mathieu, des métrorragies d'abondance redoutable et qui précèdent ou coexistent avec l'apparition de la phlébite des membres inférieurs. Mais Cotte & Mathieu ne paraissent pas avoir fait un rapprochement entre phlébite et métrorragie.

Weil et Isch-Wahl montrent la fréquence des phlébites, des thromboses et des embolies dans un syndrôme qu'ils ont appelé l'hémogénie.

En 1950, Laffont & Bonafos, signalent que devant des méno-métrorragies dites essentielles, survenant chez des jeunes filles ou chez des femmes à la ménopause, l'étude macroet microcospique de l'utérus après hystérectomie montre une muqueuse épaissie avec des foyers de nécrose et de petits infarctus.

Enfin, par des procédés d'explorations différentes Guilhem & Baux ont montré que thromboses et métrorragies étaient deux manifestations souvent associées et ils concluent que les métrorragies ou l'hyperménorrhée pourraient être une des manifestations cliniques des phlébites latentes.

Le but du présent exposé est de montrer les relations entre les deux phénomènes, thromboses et métrorragies qui ne semblent pas avoir été retenues jusqu'à pré-

---

*Gynecologue-Accoucheur des Hopitaux de Paris.
2 Mars 1956.

sent. Ces métrorragies en effet, conduisaient la plupart du temps à une hysterectomie; l'examen grossier de la pièce opératoire était le plus souvent négatif mais on n'en tirait aucune conclusion. On savait seulement que ces hystérectomies apparemment simples étaient fréquemment, et de façon précoce, suivies de phlegmatias extensives dont la raison demeurait inconnue. Ducuing dans une étude récente sur le "fibromyome utérin" avait signalé la fréquence des lésions veineuses à type de thrombose évolutive pouvant faciliter l'apparition de ces "phlébites spontanées ou post-opératoires."

En 1954, G. Duperroy de l'Université de Louvain, publie une étude clinique et histologique de l'utérus myomateux en rapport avec la pathologie de l'hémorragie utérine anormale chez la femme. Il met en évidence le rôle prépondérant des lésions vasculaires endométriales dans la pathogénie de nombreux troubles menstruels dits "fonctionnels": il s'agit de lésions de sclérose du système artériel spiralé de la base de l'endomètre, accompagnées ou non de "lésions veineuses" du type dilatation des veines ou des lacs sanguins.

Notre exposé aura donc pour but de montrer qu'il existe des thromboses pelviennes isolées ou des thromboses à début pelvien, contrairement aux idées admises jusqu'à présent, mais surtout des thromboses qui peuvent être sans caractère extensif, sans atteinte surale et dont la seule manifestation est la métrorragie. Leur existence est démontrée par l'histologie endométriale, l'histologie de la pièce opératoire.

En conclusion, cet exposé aura pour but: 1. De faire rejeter dans certains cas le traitement chirurgical au profit d'un traitement médical. 2. De faire instaurer un traitement médical post-opératoire précoce, si l'intervention a été pratiquée, pour éviter l'extension de la thrombose aux membres inférieurs et l'apparition d'une embolie. 3. De faire reconnaitre surtout une nouvelle cause aux métrorragies post-ménopausiques. On sait que, mis à part le cancer, beaucoup de causes échappaient à l'examen macroscopique ou microscopique, et qu'en l'absence même de toute lésion on portait le facile diagnostic de métrite, de métropathie hémorragique sénile sans substratum anatomique.

A. Métrorragies et thromboses au cours de maladies connues.—Nous considérerons d'abord les phénomènes métrorragiques au cours des polypes fibreux sphacélés et des fibromes.

Nous savons que les fibrômes ou les polypes peuvent rester très longtemps silencieux et s'accompagner brutalement de métrorragies très abondantes.

Le tableau correspond à la description donnée par Cotte & Mathieu, confirmée dans un cas d'ailleurs par Lecène: hémorragies très abondantes, déterminant un état d'anémie vite alarmant.

Les auteurs précédents ont assisté à l'évolution jusqu'à l'installation de la phlébite des membres inférieurs, *mais l'examen histologique de l'endomètre que nous pratiquons, permet de déceler le processus de thrombose à un stade beaucoup plus récent.*

Par l'intervention précoce, qui était d'ailleurs à cette époque, rejetée par Cotte & Mathieu, mais pratiquée par Malley-Guy & Alamartine, on peut constater la thrombose des vaisseaux pelviens, du myome, et surtout du pédicule.

En fait donc, on peut considérer ces phénomènes comme une nécrobiose par infarctus du myome dû à un processus thrombotique. Cette théorie pathogénique parait valable dans un certain nombre de cas particuliers et nous en rapprocherons les citations qu'en a faites Ducuing. Cet auteur dit: "il existe des nécrobioses massives, partielles ou parcellaires du fibrôme, relev [illegible] miqu [illegible] ar[illegible]s pouvent [illegible] lète de l'apport sanguin."

"Les nécrobioses aigües correspondent à des mortifications aseptiques rapides. Ce sont les fibrômes les moins bien vascularisés qui subissent de telles dégénérescences, mais le caractère brutal de la nécrobiose est donné soit par des dislocations vasculaires traumatiques au niveau de la capsule, soit par des *lésions subites de phlébites ou d'artérites avec thromboses plus ou moins étendues*."

C'était déjà l'opinion de Faulkner en 1947.

Le diagnostic de thrombose peut être fait lorsqu'on est appelé à faire un curettage biopsique avant l'intervention, lors de la période métrorragique. *L'examen histologique montre l'existence de ces thromboses* (Fig. 1). Ce phénomène de thrombose semble souvent arrêté par l'intervention, il peut néanmoins se poursuivre, rester localisé au pelvis ou s'étendre aux membres inférieurs. Ces thromboses pelviennes expliquent l'existence des phlébites des membres inférieurs et des migrations emboliques précoces si graves et dont l'existence grève encore la chirurgie du fibrôme.

B. Métrorragies des suites de couches sans infection ni rétention placentaire.—La description de tels phénomènes est dûe à Couvelaire et à son élève Digonnet qui ont insisté sur la "forme métrorragique de l'infection puerpérale." Ils ont montré qu'à côté de la rétention placentaire et du processus infectieux il faut, dans l'étiologie de ces hémorragies, faire une place importante aux thromboses qui s'accompagnent de signes cliniques particulièrement évocateurs:

—métrorragies précoces, apparaissant 1 à 2 semaines après l'accouchement avec accélération du pouls, sans fièvre.

—métrorragies de grande abondance, entrainant une altération importante de l'état général, et conduisant, devant l'échec des thérapeutiques habituelles, à l'hystérectomie.

—métrorragies précédant, mais non toujours, de quelques jours ou de quelques

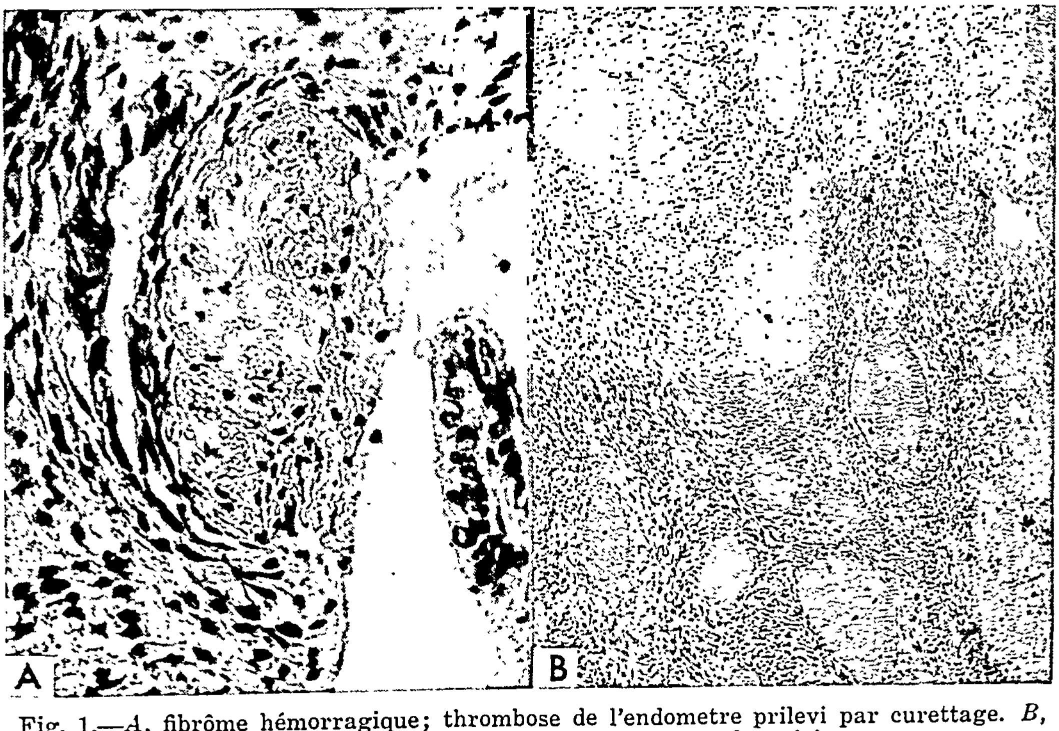


Fig. 1.—*A*, fibrôme hémorragique; thrombose de l'endometre prilevi par curettage. *B*, sur la piece operatoire thrombose du muscle utérin.

heures l'atteinte des membres inférieurs.

Dans un certain nombre de cas, la thrombose des membres inférieurs ne s'installe pas, mais les travaux de Guilhem & Baux surtout ont montré que dans les mois suivants, il peut exister des phénomènes métrorragiques et que la phlébographie peut mettre en évidence des lésions de thrombone.

De même si l'on faisait, comme nous l'avons pratiqué, des examens histologiques soit dans les 20 jours qui suivent l'accouchement, soit dans les mois suivants, on voit des processus de thrombose en pleine évolution.

C. Les accidents métrorragiques après curettage. La métrorragie n'est pas un signe certain de rétention placentaire et avant de faire une évacuation complète de la cavité utérine, il est très souvent utile de faire un examen histologique de l'endomètre, *qui, prouvant l'absence de rétention* de cotylédons placentaires et la présence de thrombose, est un signe en faveur d'une phlébite qui pourra s'étendre aux membres inférieurs. L'existence de ces thromboses permettra de faire un traitement anti-coagulant précoce.

Nous allons considérer maintenant les cas dans lesquels il n'existe dans les antécédents absolument aucune anomalie génitale.

Le problème est très différent suivant que l'on se trouve (1) en période pré-ménopausique et (2) en période post-ménopausique.

1. *En Période Pré-Ménopausique: Nous mettons en évidence une autre cause de métrorragies pré-ménopausiques: la thrombo-phlébite du pédicule utéro-ovarien et les thromboses de l'endomètre sans cause évidente.*

Deux séries de faits doivent être distinguées suivant l'intensité des métrorragies: (a) les métrorragies peu abondantes permettant l'expectative; (b) les métrorragies très abondantes entrainant un état d'anémie considérable, résistant à toutes les thérapeutiques, sauf à l'opération hémostatique.

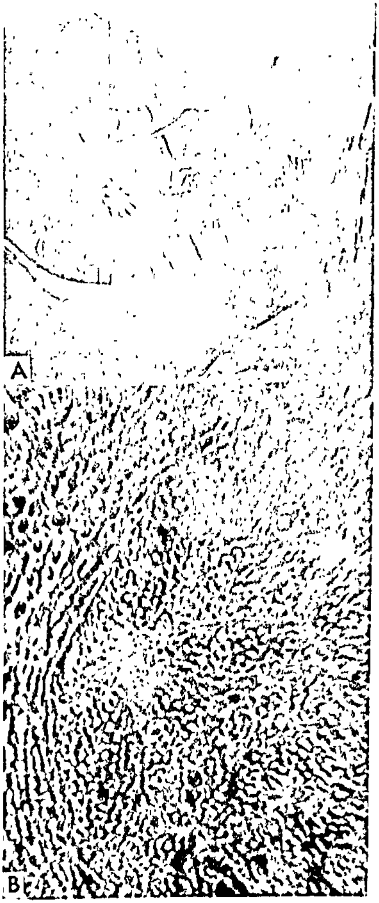


Fig. 2.—*A*, sur la pièce operatoire, thrombose de la veine uterine. *B*, vaisseau thrombose avec debut d'organisation.

Dans le premier cas, seul l'examen his-

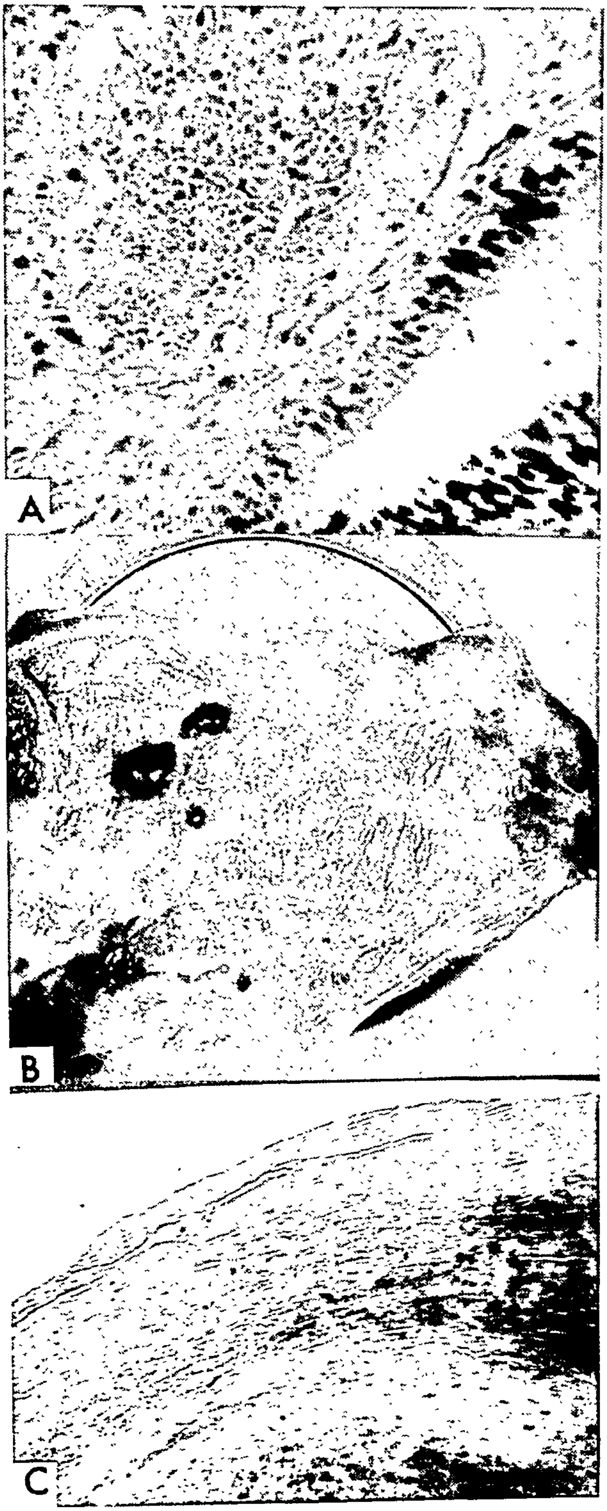


Fig. 3.—*A*, thrombose endometriale. Biopsie préoperatoire. *B*, caillots dans les vaisseaux du mésosalpinx. *C*, caillot Intravasculaire stratifié non capillarisé.

tologique de l'appareil génital et plus particulièrement la biopsie de l'endomètre est capable de montrer des thromboses localisées à l'endomètre et de faire supposer la cause.

Dans le cas d'hémorragies abondantes on pratique l'opération chirurgicale et c'est elle qui est *le seul moyen d'hémostase,* la thrombose est une *découverte opératoire* (Fig. 2).

Obs. X.—Madame R., 49 ans, est adressée par son médecin pour des métrorragies persistant depuis deux mois malgré une thérapeutique symptômatique et hormonale.

La muqueuse examinée après biopsie de l'endomètre ne présente aucun caractère pathologique, mais à l'hystérographie on découvre une image suspecte à droite. Hystérectomie totale. Suites opératoires normales.

L'examen macroscopique de la pièce opératorie montre une artère utérine calcifiée—un caillot qui fait issue à la section du pédicule utérin et une muqueuse hypertrophique.

Examen histologique: (Pr. Ag. Duperrat—n° 46.673). "Plusieurs blocs ont été faits dans la pièce d'hystérectomie:

1. La région cervicale est le siège d'une adénomatose kystique bénigne.
2. La muqueuse corporéale apparait de type folliculinique moyen. Je ne trouve pas de thrombose.
3. Un des ovaires contient un kyste assez volumineux lutéinique, très ancien. La paroi est en voie de fibrose.
4. Il existe des thromboses dans plusieurs veines utérines. Certaines sont récentes. Par contre, d'autres sont complètement organisées et même réperméabilisées. L'artère utérine est dure et fibreuse. Je n'ai pas trouvé de calcaire sur la coupe."

2. *En Période Post-Ménopausique:* Une femme ménopausée vient consulter pour métrorragies, habituellement irrégulières, d'abondance variable et sans cause évidente. Il est alors classique d'envisager la néoplasie même en l'absence de tout signe relevant de la cytologie de l'hystérographie et de la biopsie et la constatation de la thrombose est une surprise opératoire.

Notre attention fut attirée sur ce sujet par l'observation d'une femme de 48 ans, ménopausée depuis deux ans et qui présentait depuis plusieurs mois des métrorragies de faible abondance.

Malgré la négativité de toutes les explorations on pratique une hystérectomie totale: l'utérus est petit. A l'ouverture, on découvre une muqueuse utérine absolument rase, mais une des veines utérines contient un thrombus.

L'examen histologique montre par contre la thrombose d'une grosse veine utérine, thrombose ancienne avec un début d'organisation. Il s'agit donc bien là d'une thrombo-phlébite sug-aigüe de la veine utérine droite.

L'observation d'une autre malade, âgée de 57 ans, ménopausée depuis 15 ans, a été pour nous beaucoup plus démonstratif. Cette malade avait reçu des implants d'oestrogènes pour des phénomènes post-ménopausiques; les troubles disparurent pendant trois mois mais des métrorragies absolument incoercibles apparurent.

L'hystérographie montrait une cavité tellement modifiée qu'elle nous paraissait typique d'un adéno-carcinome de l'utérus mais on fut surpris, à l'examen histologique de l'endomètre, de trouver une hyperplasie glandulo-kystique, avec des thrombose (Fig. 3*A*).

Néanmoins on opéra et on fit une hystérectomie totale. L'utérus était extérieurement peu modifié, bien qu'à l'ouverture on trouve un petit myome intra-mural. Dans les deux mésosalpinx on trouve des caillots anciens bien visibles par transparence et gros comme un pois. La muqueuse utérine est très *hypertrophique*. *Certains* vaisseaux du mésosalpinx étaient béants et vides; par contre, toutes les veines sont obstruées par des caillots sanguins non suppurés (Fig. 3*B*). A l'exception d'un point, ces caillots ne sont pas encore organisés. D'autres caillots intra-vasculaires, présentent des stratifications avec organisation assez avancée. Toutefois, ils ne sont pas encore capillarisés (Fig. 3*C*).

Dans les suites opératoires évolua une phlébite typique des membres inférieurs. D'ailleurs, cette malade avait présenté à la suite d'un avortement antérieur et de deux grossesses précédentes, une phlébite des membres inférieurs.

Plusieurs mois après on assista à l'apparition d'oedème des membres inférieurs avec perturbation des temps de saignement, decoagulation et du test à l'héparine. Il semble que chez cette malade on assiste à l'évolution d'une thrombo-phlébite chronique.

De l'étude de ces observations nous pouvons tirer les conclusions suivantes:

Ces métrorragies peuvent apparaitre à n'importe quel stade de la vie génitale.

Elles peuvent faire partie d'un syndrôme clinique complexe, et la thrombose vasculaire n'est pas rendue responsable à première vue, d'une hémorragie que semble expliquer une cause locale, car quelques fois il y a un polype sphacélé, un fibrôme. Mais par contre elles peuvent être l'unique signe qui conduit à l'opération et, seul, un examen anatomique du pelvis et de la pièce d'hystérectomie pourra déceler les thromboses.

Pour éviter ce recours à une chirurgie mutilante et utiliser un traitement médical efficace, peut-on poser un diagnostic rapide et certain? *Autrement dit, ceshémorragies utérines ont-elles des caractères cliniques ou paracliniques permettant de les rattacher à une thrombose?*

1. L'aspect, l'abondance, la fréquence des métrorragies sont très variables. Métrorragies quotidiennes, peu abondantes *et irrégulières ou alors d'abondance* considérable, prolongées avec caillots et même incoercibles, réalisant la forme anémique décrite par Cotte & Mathieu.

Dans tous les cas, leur signe commun est *l'incoercibilité la persistance malgré le curettage et les thérapeutiques hémostatiques ou hormonales* pendant plusieurs semaines.

Par contre, dans t a pu employer les *antico* métrorragie ne posait mie, un problème d'hémostase immédiat, l'action a été rapide et durable.

2. L'interrogatoire de la malade peut révéler une notion importante, celle d'antécédents variqueux ou phlébétiques ou même embolie pulmonaire à symptômatologie larvée.

Chez les malades où les manifestations surviennent dans les suites de couches, on retrouve souvent des métrorragies attribuées à un placenta praevia.

3. L'examen peut être encore plus suggestif si l'on se trouve en présence d'une phlébite des membres inférieurs en pleine évolution. Cette dernière permet le diagnostic anatomo-pathologique.

4. *Mais la biopsie de l'endomètre* reste néanmoins un examen essentiel pour le diagnostic. L'étude de la pièce prélevée, faite par un anatomo-pathologiste qualifié, permettra à elle seule, de confirmer ou de poser le diagnostic.

Dans les cas rares, où il n'y a pas de thromboses visibles dans l'endomètre, il en existe toujours dans les vaisseaux des pédicules utérins ou utéro-ovariens.

L'association d'une endométrite et d'altérations vasculaires est déjà significative.

5. Par contre, les autres investigations para-cliniques n'apportent que peu de renseignements: la vitesse de sédimentation est fonction de l'infection associée ou de l'anémie consécutive. L'étude de la résistance à héparine et de la crase sanguine, la formol-gélification, en-dehors de quelques cas d'hypercoagulabilité ne sont pas toujours concluantes; mais positives dans certains cas hésitants, elles prennent une valeur considérable soit pour établir le diagnostic, pour compléter l'acte opératoire ou le faire suivre d'un traitement anticoagulant précoce.

6. *L'évolution spontanée des accidents* est très variable.

a. Des métrorragies abondantes peuvent se poursuivre imposant l'intervention. L'extension post-opératoire des thromboses entrainera une surveillance rigoureuse et un précoce traitement par anticoagulants si les tests se modifient dès les premiers jours.

b. En l'absence de tout traitement, les métrorragies n'ont aucune tendance spontanée à l'arrêt. Dans les formes de la ménopause qu'on pourrait appeler "médicales" l'atteinte des membres inférieurs peut ne pas apparaitre, mais les métrorragies se poursuivront avec une persistance désespérante.

c. Enfin, la thrombose pelvienne peut s'étendre aux membres inférieurs surtout ou se compliquer d'embolies.

7. Bien que les accidents peuvent apparaitre à tous les stades de la vie génitale, leur fréquence est beaucoup plus grande à la ménopause.

Anatomie Pathologique Macroscopique.—Cet examen peut être déjà évocateur et commande un examen histologique approfondi: dès l'ouverture de l'abdomen on peut être frappé par une augmentation du volume utérin, une dilatation intense de tout le système vasculaire pelvien et même par de nombreuses thromboses dans les pédicules infundibulo-pelviens ou le mésosalpinx. D'autres fois, l'utérus peut être normal ou atrophique; les thromboses, plus localisées, n'apparaissent qu'à la coupe. Elles atteignent soit les vaisseaux utérins, soit les vaisseaux des pédicules utéro-ovariens.

Dans certains cas enfin, les vaisseaux peuvent paraitre normaux et c'est l'examen microscopique seul, qui révèle les foyers de thrombose.

Par ailleurs, l'examen macroscopique suffit souvent pour mettre en évidence des lésions de sclérose artérielle (artères utérines dures et calcifiées).

Signalons enfin l'aspect asphyxique, *le pré-infarcissement de l'utérus et l'hemorragie intra-tubaire* que nous avons observé une fois.

L'Examen Histologique.—L'examen histologique précise le caractère de ces *lésions vasculaires.*

Au niveau des pédicules utéro-ovariens: les veines sont souvent dilatées, parfois béantes. Leur paroi est tantôt peu altérée, tantôt au contraire très épaissie, avec des lésions de phlébite chronique: prolifération conjonctive de la couche sous-endothéliale et de la tunique moyenne sclérose de l'adventice.

La lumière vasculaire est souvent obstruée par un caillot plus ou moins récent, ou déjà en voie d'organisation.

L'artère utérine: le plus souvent normale peut être sclérosée, avec envahissement fibreux et même dépôts calcaires.

Les vaisseaux du mésosalpinx sont tantôt normaux, tantôt béants, vides ou thrombosés.

Au niveau du myomètre: à côté de la fibrose banale en relation avec l'âge de certaines malades, on peut constater soit l'existence de plages d'oedème, soit une infiltration discrète par des éléments leucocytaires, sans signes de suppuration, mais surtout des dilatations et thromboses vasculaires.

Au niveau de l'endomètre: outre des lésions d'hypo ou d'hyperplasie, on peut trouver une augmentation du nombre, une dilatation, une béance des vaisseaux sanguins et lymphatiques, une altération des parois vasculaires et des foyers de thrombose. Ces foyers de thrombose n'existent jamais en dehors des cas de grande suppuration post-abortum. Ils ont, en quelque sorte, un caractère pathognomonique. Mais ils risquent de passer inaperçus quand on n'a pas l'attention attirée sur ces faits.

Les thromboses sont parfois récentes, pures; souvent leur ancienneté est manifeste, comme en témoignent les différents stades de leur organisation: envahissement par des cellules endothéliales—accumulation de pigment hématique et tendance fibroïde organisante—*stratification et* même parfois, capillarisation.

Physiologie Pathologique. — C'est une question que nous avons envisagée dans un travail que nous avons publié par ailleurs. Nous avons considéré les altérations des vaisseaux, les altérations sanguines, les altérations concomitantes du contenu et du contenant, la possibilité de troubles endocriniens. Il ne semble pas qu'aucune des hypothèses envisagées puisse nous donner satisfaction.

Traitement.—De nos observations précédentes et de leur critique, il résulte que, dans tous les cas, où le diagnostic est posé, il faut avoir recours au traitement médical.

1. *Avant la ménopause:* Devant le moindre soupçon, tout devra être mis en oeuvre pour confirmer le diagnostic. Si cela est fait, on aura ainsi la satisfaction d'éviter l'hystérectomie et d'obtenir la guérison par le seul traitement médical anticoagulant, sauf si les métrorragies obligent à l'acte opératoire.

2. *Après la ménopause:* Si le diagnostic est évident et que toute lésion néoplasique est exclue, on se contentera du traitement médical.

Ce traitement est d'intensité variable suivant les manifestations associées et sera surveillé par les tests biologiques habituels en ce cas (vitesse de sédimentation—taux de prothrombine—test à l'héparine).

Nous n'insisterons pas sur le traitement désormais classique de la phlegmatia confirmée au cours de laquelle le métrorragie n'est qu'un épiphénomène. Par contre, dans les formes que nous avons appelées médicales, formes métrorragiques pures, sans autre manifestation clinique, *le traitement prolongé à petites doses* nous parait présenter un intérêt considérable: 1/2 comprimé de Tromexane tous les deux jours ou 50 mg d'héparine trois fois par semaine pendant un à deux mois. Ce traitement permet le retour d'un cycle menstruel normal.

En cas de doute, l'hystérectomie restera encore la solution de prudence.

3. *Dans les suites opératoires et dans tous les cas* il faudra mettre en oeuvre très précocement dès la 48 ème heure, un traitement par l'Héparine, seul moyen de prévenir de façon efficace:

—une embolie précoce.

—des phlébites des membres inférieurs et ce, même en l'absence de manifestations évidentes à leur niveau.

4. *Enfin, dans les cas suivants:*

—fibrôme présentant des thromboses,

—polype en voie de nécrobiose avec thrombose,

—thromboses sans causes déterminées, mais avec envahissement des pédicules utéro-ovariens, il faut envisager sérieusement pour éviter les embolies par extension secondaire du processus de thrombose à la voie hypogastrique, une ligature de la veine cave.

L'opération, prônée surtout par Leger, nous a donné dans des cas semblables, des résultats intéressants (Bret).

CONCLUSIONS

L'existence de thromboses latentes et spontanées dans les territoires veineux jambiers et mésentériques avait été soupçonnée ou mise en évidence par de nombreux auteurs, depuis plusieurs années.

Cette possibilité, dans le domaine pelvien et plus particulièrement utérin, n'a été envisagée jusqu'à présent que dans le cadre restreint du fibro-myome en voie de nécrose et de sphacèle.

1. Nous avons voulu montrer au contraire que des thromboses latentes et spontanées des vaisseaux utéro-ovariens, peuvent apparaitre à tous lesâges de la vie. Elles peuvent survenir chez des femmes en période d'activité génitale, mais surtout *en période pré-ménopausique* ou en *pleine ménopause*. Nous rappelons egalement que ces phénomènes peuvent se rencontrer dans le post-partum, dans le post-abortum et fairepartie de la symptômatologie des polypes fibreux ou desfibrômes saignants.

2. La traduction clinique de ces thromboses est constituée, dans tous les cas, par des *métrorragies* d'allure variable en ce qui concerne leur abondance et leur fréquence; leur caractère commun et pathognomonique est d'être rebelle aux thérapeutiques symptômatiques ou hormonales, mais de céder au traitement anti-coagulant quand celui-ci peut être appliqué.

3. En l'absence de ce traitement, l'évolution se fait souvent par l'extension du processus thrombo-embolique. Embolie pulmonaire—phlébite des membres inférieurs.

4. Soupçonné sur le caractère clinique et évolutif de ces métrorragies, survenant chez des femmes présentant souvent des antécédents variqueux ou phlébitiques, le diagnostic peut être confirmé par l'examen biopsique de l'endomètre. Il permet en effet, de retrouver des lésions de thromboses, localisées ou diffuses, parfois récentes, plus souvent anciennes et déjà organisées. La phlébographie par voie utérine selon Guilhem & Baux parait être dans ces cas, une exploration très utile.

5. Un diagnostic précoce, étant ainsi réalisable, on évitera à ces malades le recours, jusqu'à maintenant habituel, à l'hystérectomie, au profit d'un traitement médical anticoagulant toujours efficace.

Dans les cas où l'intervention est cependant pratiquée (crainte d'une néoformation chez une femme ménopausée ou métrorragie abondante) on sait désormais qu'un traitement anticoagulant post-opératoire, précoce et énergique, est indispensable pour prévenir l'apparition d'accidents emboliques et phlébitiques, ou du moins, pour en diminuer la gravité.

6. La constatation de *ces thromboses isolées des vaisseaux de l'appareil génital d'allure aigüe, subaigüe ou chronique,* l'absence fréquente d'extension aux membres inférieurs et de troubles biologiques dans les suites opératoires, sans qu'un traitement anticoagulant ait été institué, plaide en faveur:

—*du début pelvien*

—*de la localisation pelvienne non extensive* d'un certain nombre de thromboses.

7. Les thromboses fréquentes au moment de la ménopause ne sont qu'un des phénomènes qui aboutissent à la régression et à la mise au repos d'un appareil génital désormais caduc: *c'est un signe de vieillissement.*

SUMMARY

The author presents a study of latent and spontaneous thromboses of the utero-ovarian vessels, which often occur in women of middle age. They sometimes occur in women during the period of sexual activity, but more frequently during the premenopausal period or in midmenopause. They may also appear post partum or post abortum, manifested by symptoms like those of fibrous polyp or bleeding fibroma.

The clinical interpretation of these thromboses is arrived at by means of the metrorrhagias, their abundance and their frequency. Their pathognomonic characteristic is resistance to symptomatic or hormonal therapy, but they may yield to anticoagulant therapy when this is tried.

In the absence of this treatment, the extension of the thrombo-embolic process takes place (pulmonary embolism, phlebitis of the lower limbs).

These metrorrhagias occur frequently in women with a history of varices or phlebitis. The diagnosis can perhaps be confirmed by biopsy of the endometrium, which permits recognition of thrombotic lesions, localized or diffuse, usually recent but sometimes old and organized. Phlebographic study by the uterine approach, according to Guilhem and Baux, is a most useful procedure. An early diagnosis, therefore, is possible.

BIBLIOGRAPHY

Berry & Bougas: Ann. Surg. 132:450, 1950.

Bret, A. J.: Ligature de la veine cave et hystérectomie pour volumineux polype fibreux en voie d'expulsion, avec phlegmatia concomittante. (P. M. N° 83,

Bret &
de la gro
de l'hémat
à répétition. Traitement vitaminique et cortisonique, Gyn. et Obst. 53:618-639, 1954.

Bret, Duperrat & Grenier: Métrorragies signes de thromboses pelviennes latentes (Rev. de Gyn. et Obst. 1955, n° 1-2, p. 19. Presse Médicale n° 10, 1955, p. 181-185. Sté d'Angéiologie du 29/4/55. Société Fr. de thérapeutique et de pharmacologie: 15/6/55).

Bret & Duperrat: Documents histologiques sur les modifications des vaisseaux de l'endomètre des femmes hypertendues, Gyn. et Obst T. 47:349, 1948.

Cotte & Mathieu: Quelques cas de phlébites spontanées au cours de l'évolution des myomes utérins, Gyn. et Obst. 30:208, 1934, avec Bibliographie).

Croizat, Planche, Fabre, Gilly & Morel: Troubles endocriniens et syndrômes hémorragiques, Le sang: n° 3, 1952, p. 269.

Diagnostics Anatomo-Cliniques de Lecene: Appareil génital II, p. 100.

Digonnet: Contribution à l'étude des hémorragies secondaires du post-partum. (Thèse Paris, 1928, n° 84.)

Ducuing: Le fibro-myome utérin. Masson, 1946

Duperroy: Contribution à l'étude clinique et histopathologique de l'utérus myomateux en rapport avec la pathogénie de l'hémorragie uterine anormale chez la femme. Revue belge dePath et de Méd. expérimentale. T. XXII, suppl. IX, Avril 1954.

Faulkner: Am. J. Obst. & Gyn. 49, 1945; 53:474, 1947; 61:766, 1951.

Grasset, Bret, Fiehrer & Baumann: Les incoagulabilités sanguines en Obstétrique (P. M. n° 68, 1951.)

Guilhem & Baux: La phlébographie pelvienne. Masson, Paris, 1954.

Horizons Medicaux: Thromboses veineuses à répétition dans la hernie diaphragmatique. 1954, n°8.

Laffont & Bonafos: Hémorragies génitales. E.M.C. Gyn. T. 1, 6/1950, 47/48.

Lecene: Voir Diagnostic anatomo-clinique.

Leger & Frileux: Les phlébites. Masson, Paris, 1950.

Leriche: Réflexe veino-artériel aucours d'une ancienne phlébite. P. M. n° 20, 9/12/1944.)

Michon, Moulonguet & Blamontier: Hémorragies par endovascularite thrombosante. (Bull. Soc. Obst. Gyn. Paris. T. XIV, n° 6, 1926, p. 135.)

Quenu, Jacquelin & Leger: Infarctus intestinal par thrombose veineuse. Mém. Acad. de Chir. N° 4/5, 1952, p. 132.

Rouchy & Lamotte: Métrorragies post-ménopausiques non cancéreuses. Problèmes étiologiques et thérapeutiques, Rev. de Gyn. et d'Obst. n° 3-4, Mars-Avril, 1955, p. 87.

Symmers: La micro-angiopathie thrombotique. Le sang, n° 5, 1955, p. 397.

Tixier: Congrès de Chirurgie, 1932.

Vecchietti: Sur l'action héparinique folliculi" de l'ovaire humain. (Minerv. gica, 1955, n° 10, p. 327-343.)

Villaret, Ca réacti

culaires du cerveau au cours des embolies solides et gazeuses. (P. M. n° 89, 6 Novembre, 1937.)

Weill & Isch-Wahl: Les hémorragies utérines sanslésions utérines. Le sang, n° 7, 1935, p. 681.

◆

Editor's Note: In the Journal issue of December 1955, two articles in the *Section en Francaise,* "Neuroplegie et Hibernation" by Prof. Dr. H. Laborit and "Grossesse et Cancer du Col aux Stades 0 et 1" by Prof. Dr. P. Funck-Brentano, appeared without summaries. These have now been received for both articles and are presented below.

RESUME (Prof. Laborit)

L'auteur indique la distinction pathologique entre le syndrome clinique et réactionel de la neuroplégie.

La prophylaxie et son traitement consistent des interdictions nerveuses et hormonales au moyen des pharmacodynamiques. Une étude des expériences sur des interdictions périphérales, centrales et cellulaires est presentée. L'information été fournie par les stimulations neuromusculaires interprêtées selon la courbe de la stimulation quant à la duration et l'intensité.

La prophylaxie et le traitement du syndrome clinique consistent de l'hibernation. Plusieurs expériences fondamentales sont présentées et discutées.

L'auteur explique aussi l'usage potentiel de l'anesthésie et il présente une orientation sur la therapeutique post-opératoire.

Quelques observations critiques concernant des méthodes sont aussi inclus.

SUMMARY (Prof. Laborit)

The author points out the pathologic distinction between the clinical and the reactional syndrome of neuroplegia.

The prophylaxis and treatment of the latter consists of neural and hormonal inhibition by means of pharmacodynamics. A study of experiments on peripheral, central and cellular inhibition is presented. Information was furnished by neuromuscular stimulation, interpreted from the curve of stimulation as to duration and intensity.

The prophylaxis and treatment of the clinical syndrome consists of artificial hibernation. Several basic experiments in this field are presented and discussed.

The author also comments on the potential use of anesthetics and presents an orientation for postoperative therapy.

A number of criticisms of these methods is included.

RESUME (Prof. Funck-Brentano)

L'auteur discute les problèmes concernant le diagnostic et le traitement du cancer du col, aux stades 0 et 1, sur le col gravidique. Il donne un brèf résumé des publications en prouvant d'une manière évidente l'influence infavorable de la grossesse.

La symptomatologie ne diffère guère de celles du cancer de la femme non gravide.

Ni les métrorrhagies seules ni les résultats des examens vaginaux donnent des conclusions. Comme assistance diagnostique l'auteur recommende l'éxamen au speculum, le teste de Schiller et l'étude colposcopique, suivits par la biopsie affirmant le diagnostic.

Le traitement dépend sur l'âge de la grossesse. Les méthodes proposées sont triples: 1. la chirurgie, 2. les rayons X ourla radiothérapie et 3. une combination des deux. Pourtant les irradiations ne sont pas recommendées parce que trop souvent ils son suivits par des malformations et anomalies du foetus.

En choisissant le traitement, le chirurgien ne doit pas considérer seulement les chances de guérison, mais aussi la condition de la patiente au point du risque chirurgique, particulièrement si elle a déjà de nombreux enfants. Pour la majorité des patientes entre le cinquième et le sixième mois de la grossesse l'auteur recommende l'hystérectomie evacuatrice selon la méthode de Wertheim.

SUMMARY (Prof. Funck-Brentano)

The author discusses the difficulties in diagnosis and treatment of cervical cancer, Grades 0 and 1, in pregnant women.

The symptoms differ little, if at all, from those of cervical cancer in nonpregnant women. Metrorrhagia alone is not conclusive, nor are the results of digital vaginal examination. As diagnostic aids the author recommends examination by speculum, Schiller's test and colposcopic study, followed by biopsy for confirmation.

Treatment depends upon the stage of the pregnancy. Up to the fourth month the welfare of the mother is the sole consideration. From the fourth to the seventh month a policy of watchful waiting may be followed. After the seventh month a normal birth, by cesarean section if necessary, is the paramount consideration.

There are three possible therapeutic methods: (1) surgical intervention, (2) roentgen or radium *therapy and (3) a combination of the two.* Irradiation during pregnancy, however, is not recommended, since it is too often followed by anomalies in the fetus. Also, the surgeon must bear in mind not only the chances of curing the cancer but the status of the patient as an operative risk, especially if she has other children. For patients in the fifth or sixth month the author does an evacuating hysterectomy followed by Wertheim's procedure.

L' Episiorraphie

JACQUES RENE M. C. PETIT, M.D., F.I.C.S.
SCEAUX-SEINE, FRANCE

LES cas sont assez rares mais ils existent cependant, où, devant un volumineux prolapsus utérin chez une femme âgée, fatiguée, usée, le chirurgien abandonne tout acte chirurgical au profit du détestable et inhumain pessaire.

J'ai eu quelquefois ce problème à résoudre et je n'avais pas trouvé de solution satisfaisante jusqu'au jour récent où, ayant à réparer une malfaçon dont j'étais l'auteur, j'ai mis au point un procédé vieux comme le monde rajeuni par un chirurgien espagnol.

Voici tout d'abord l'histoire de ma malade:

Il s'agissait d'une femme de 70 ans présentant un volumineux prolapsus utérin. Je lui propose un Lefort qu'elle accepte immédiatement. L'intervention se déroule de la façon la plus banale quand au 6 éme jour éclate une prémière embolie pulmonaire suivie de 5 autres qui amènent mon opérée au seuil de la mort. Grâce à la novocaîne intra-veineuse d'une part, grâce d'autre part à l'héparine et à la troméxane dont l'administration fut régulièrement contrôlée par les tests biologiques habituels, je jugule les phénomènes d'hypercoagubilité mais j'enregistre un suintement hémorragique qui sans être inquiètant n'en est pas moins abondant. Toujours est-il qu'au 14 ème jour, l'hématome a provoqué la désunion de mes sutures, mon Lefort a presque complètement laché et, à peu de chose près, je me trouve devant une situation identique à celle qui avait incité cette brave femme à me consulter.

L'heureuse époque des grandes vacances écoulée je me trouve devant la triste réalité, c'est-à-dire devant un Lefort manqué.

Pour mon interlocutrice il n'est plus question ni d'opération importante, ni d'une hospitalisation et encore moins d'anesthésie générale. Je décide donc sous anesthésie locale de pratiquer une épisiorraphie dont la cicatrice devra assurer la contention du prolapsus.

Voici la technique détaillée que j'ai suivie pour réaliser cette épisiorraphie. Les dessins d'A. Marait en facilitent la comprèhension.

Soins pré-opératoires. — Injection vaginale antiseptique banale. Aucune thérapeutique constipante. Une ampoule de nargénol trois quarts d'heure avant l'intervention.

L'intervention elle-même. — Malade en position gynécologique. Infiltration locale de 40 cc de xylocaïne à Ip. 200 au niveau des deux grandes lèvres et des deux colpocèles.

De la point du bistouri on dessine sur le sommet de chaque colpocèle (Fig. 1*A*) un large quadrilatère que l'on avive immédiatement en réséquant avec soin la mince épaisseur de muqueuse correspondante. Hémostase à l'aide de compresses imprégnées de sérum chaud.

Franche incision au bistouri des grandes lèvres droite puis gauche en commençant en haut légèrement au-dessous du niveau d l'orifice uréthral, finissant en bas sur la ligne médiane près de la fosse naviculaire.

Résection aux ciseaux (Fig. 2) sur toute sa hauteur de la bandelette interne muqueuse de la grande lèvre précedemment incisée de façon à augmenter la surface d'avivement et de façon à rendre cet avivement continu avec les deux quadrilatères avivés des deux colpocèles.

Suture à points séparés de catgut chromé o monté sur aiguille courbe Sertix:

1. du bord inférieur du quadrilatère supérieur au bord supérieur du quadrilatère inférieur.
2. puis des bords extern

30—Novembre, 1955.

quadrilatères aux bords internes des deux grandes lèvres.

Ainsi se trouve réalisée une seule et longue surface cruentée uniforme.

Reste à suturer l'ensemble de façon globale (Fig. 3) par 2 forts crins passés en U, serrés sur bourdonnets de façon à opposer des surfaces et non des bords. Ces deux crins seront avantageusement faufilés au niveau des deux quadrilatères. Quelques points superficiels aux crins fins achèvent l'affrontement.

Soins post-opératoires.—Il n'y en a pas hormis le renouvellement d'un pansement aseptique protecteur.

Pas de sonde vésicale.

L'opérée est levée le soir même et va à la selle dès le lendemain en l'aidant d'un laxatif ou d'un suppositoire glycériné.

Les fils superficiels sont coupés le 6 ème jour, les bourdonnets le 12 ème jour.

Telle est donc la technique que j'ai suivie. Mon opérée a quitté la clinique le 5 ème jour, n'a cessé de marcher et de vaquer à ses occupations familiales. Le résultat aussi bien anatomique que fonctionnel est excellent.

Une deuxième malade, Madame R, m'a fourni l'occasion de réaliser une nouvelle épisiorraphie.

Cette femme de 69 ans, grande insuffisante cardiaque, a subi il y a 19 ans une hystérectomie vaginale et quelques années plus tard une périnéorraphie postérieure. Elle est affligée d'un volumineux prolapsus qu'elle essaie de maintenir par un pessaire. Cet appareil est à l'origine d'une vaste ulcération qui, de prime abord, me semble assez suspecte pour me commander une biopsie. La réponse de l'anatomo-pathologiste étant tout-à-fait rassurante, je propose à cette femme passablement fatiguée, une épisiorraphie suivant la technique précédemment décrite, après avoir, au préalable, électrocoagulé l'ulcération vaginale.

J'ai revu cette opérée au 3 ème mois. Elle est tout-à-fait soulagée. Anatomiquement la contention recherchée est excellente, toutefois j'ai ey tort de prolonger trop haut la fermeture, ce qui complique quelque peu la miction en brisant le jet urinaire.

L'épisiorraphie ou suture des grandes

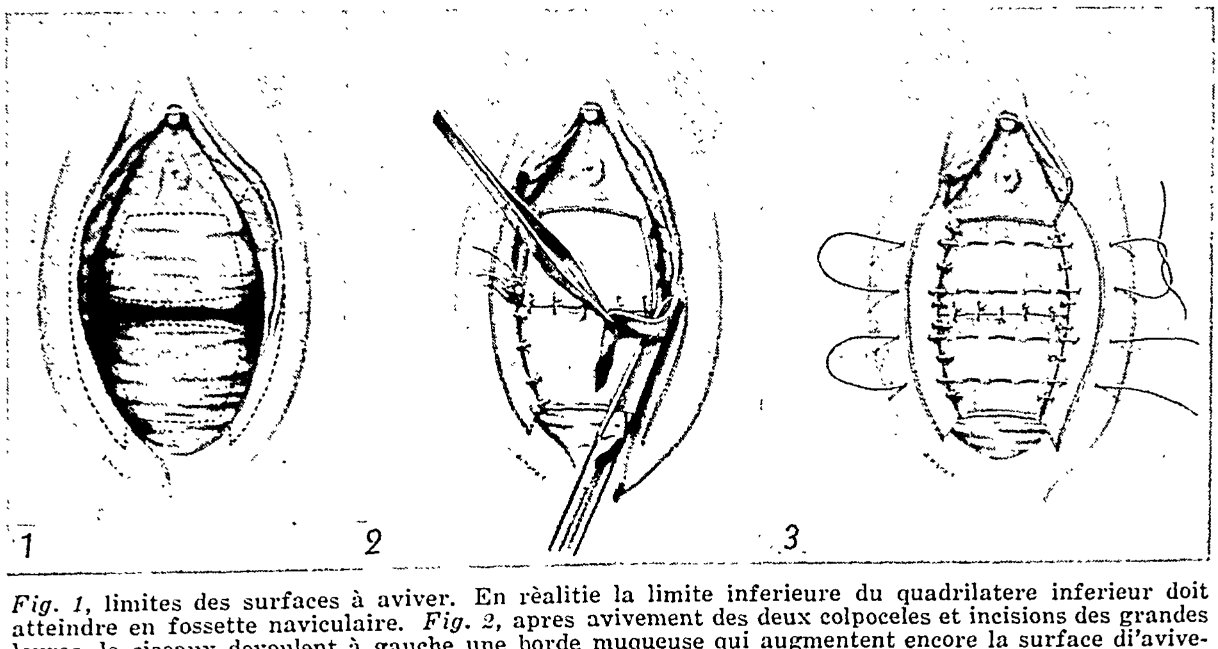


Fig. 1, limites des surfaces à aviver. En rèalitie la limite inferieure du quadrilatere inferieur doit atteindre en fossette naviculaire. *Fig. 2,* apres avivement des deux colpoceles et incisions des grandes levres, le ciseaux devoulent à gauche une borde muqueuse qui augmentent encore la surface di'avivement. Fig. 3, la differents points de suture.

lèvres n'est pas un procédé nouveau. Je l'ai trouvé cité par Micheaux dans le vieux Traité de Chirurgie de Duplay et Reclus. Siredey en dit un mot dans son Traité de Gynécologie pour le déconseiller. Conill de Barcelone lui consacre en 1953 un article dans le Maroc médical et rapporte cent cas tous couronnés de succès.

Je crois donc que l'épisiorraphie à sa place dans notre arsenal chirurgical. Comme je le disais au début de cette communication nous livrons parfois définitivement à l'odieux pessaire certains volumineux prolapsus séniles incapables d'être contenus bien souvent d'ailleurs.

Labry avait, pour de telles lésions, imaginé un cerclage vulvaire après réduction du prolapsus. Les résultats à distance ont été reconnus peu satisfaisants (Société de Chirurgie de Lyon, séance du 21-2-52). A peu de frais l'épisiorraphie peut guérir ces malades.

D'autre part, mon observation en est la preuve, un Lefort peut lacher. Polosson (Société de Chirurgie de Lyon, séance du 4-2-1954) avone dans sa statistique de cloisonnement vaginal 7,12% de lachages de sutures et il ajoute: "Ces lachages ont dû être soit repris chirurgicalement et guéris, soit confiés à un pessaire." Voilà donc une deuxième indication de l'épisiorraphie.

Enfin nous avons eu tous à résoudre le délicat problème des prolapsus après hystérectomie totale. L'excellent et élégant procédé de Diamant-Berger comporte une coeliotomie. N'est-ce pas là un geste trop important à imposer à une vielle femme?

En conclusion je dirai que l'épisiorraphie réalise une méthode ambulatoire à conseiller dans le traitement de certains prolapsus séniles auxquels on est tenté de refuser toute solution chirurgicale.

RÉSUMÉ

L'auteur décrit un procédé qui permet le traitement ambulatoire de certains prolapsus séniles jadis voués au port du pessaire.

Après avivement des colpocèles et larges incisions des grandes lèvres, il délimite une surface continue d'avivement qu'il suture un bourdonnet. Il obtient ainsi un mur résistant allant de l'orifice uréthral à lo fosse naviculaire.

Réalisable à l'anesthésie locale, ce procédé permet le lever immédiat sans pose de sonde vésicale, sans préparation intestinale.

L'auteur l'a réalisé 2 fois avec succès. De toute façon il doit être réservé aux femmes agées usées, incapables de supporter un acte chirurgical important.

SUMMARY

The author describes a procedure which permits ambulatory treatment of certain senile prolapses which formerly were treated by introduction of a pessary into the vagina.

After removing the morbid parts of the colpoceles and making large incisions in the labia majora, he proceeds to delimit a surface. He thus obtains a resistant wall running from the urethral orifice to the navicular fossa.

With the use of local anesthesia this procedure is very useful, since it does not require intestinal preparation.

The author adds that he has used the aforedescribed procedure twice, with great success. It should, nevertheless, be reserved for elderly women, or women unable to tolerate major operations.

BIBLIOGRAPHY

Bertrand et Creyssel, Traité de Thérapeutique chirurgicale, t. II, p. 2.963.

Conill, Maroc médical, 1953, p. 876.

Diamant-Berger, La colpopexie. Concours médical, déc. 1947, 69, nº 52, 2.176-2.177.

Duplay et Reclus, Traité de Chirurgie, t. VIII, p. 255.

Jean-Louis Faure et Si Gynécologie médico-chirurgical

Labry et Michoulier, L p. 852.

Polloson, Lyon chirurgical,

Editorial

Infertility Among the Ancients

FROM ancient times the reproach of barrenness has been visited upon the wife, and the cause has been assumed to be some abnormality of her reproductive organs. The problem of sterility is assigned by tradition to the gynecologist. Notable progress has been made in this field during the past twenty-five years. It has also been shown, however, that husbands carry a considerable share of responsibility, and that depressed constitutional states are causative factors—factors almost as important as local genital disorders.

The complete investigation and treatment of sterility involves work in urology, endocrinology, and internal medicine.

Before attempting to discuss ancient concepts of sterility, it is well to determine first what one means by the word itself. Sterility is best defined as inability to initiate the reproductive process. This applies to a person of either sex or to a mating. It covers unfruitfulness due to social circumstances as well as sterility due to physical incapacity.

Infertility is the all-inclusive term covering all grades of sterility.

Among primitive peoples, the source of impregnation has always been associated with godhead.[1] The Enahlayi, a tribe of East Australia, believed that girls are fashioned by the moon, boys by the wood lizard. The Pennefather Blacks in Queensland thought that a being called Anjea, who was originally made by Thunder, forms babies out of swamp mud and inserts them into the vacant womb of women. Still another tribe concluded that some god-power makes baby spirits and hangs them on certain trees, whence they more or less promiscuously entered the bodies of passing women to become incarnate.

The folklore concerning cures for sterility is voluminous. One of the common aids in supernatural impregnation is the eating of blossoms, fruit or herbs.[2] Mineral substances are thought by some to have therapeutic value in infertility, especially the filings of a wedding ring, which are swallowed, as are the powdered scrapings from saints' statues;[3] organotherapy is also popular among folk remedies for sterility. The genital organs of rabbits and foxes are dried, rubbed into a powder and taken in mare's milk by Italian peasants. Pellets of dried human placenta are eaten by some.

The earliest medical documents in existence are seven famous Egyptian papyri.[3] The two with greatest gynecologic interest are the Kahum and the Ebers. The Kahum papyrus was in a fragmentary state and pieced together; it contains directions for the treatment of various vaginal and uterine disorders; in addition, there is some discussion of pregnancy and sex determination.

The Ebers papyrus,[1] named for the German scholar who acquired and translated it, was discovered in a tomb at Thebes.

Read at a Regional Meeting of the California Surgical Division, International College of Surgeons, San Jose, California, March 22-23, 1956.
Submitted for publication April 9, 1956.

[1] Bryan, C. P.: The Papyrus Ebers. New York: Appleton, 1931.

[2] Guttmaocher, A. F.: Life in the Making. New York: Vaking, 1933. Hartland, E. S.: Primitive Paternity. London: David Nutt, 1909.

[3] Dawson, W. R.: Magician and Leech. London: Methuen, 1929.

The huge roll, twelve feet wide and sixty-eight feet long, was found perfectly preserved cradled between the legs of a mummy, probably an ancient colleague of the medical profession. Faultlessly written in black ink, with red capitals introducing each paragraph, it had lain there for more than three thousand years. The scroll consisted mainly of eight hundred and eleven separate prescriptions for salves, plasters, poultices, gargles, pills, pessaries and suppositories. A few sections deal with diagnosis and symptoms. The concluding portion is surgical. The gynecologic portion includes remedies for faulty lactation, diseases of the breast and the diseases of the genitals, as well as aids to produce abortion and hasten tardy labor.

The papyri state that to regulate menstruation the patient was douched with a mixture of garlic and wine. If this failed, a combination of fennel, honey and sweet beer was similarly used. To protect a virgin from leukorrhea, it was necessary to anoint her breast, body and limbs with a lotion prepared by crushing the dried liver of a swallow in sour milk. For the cure of uterine prolapse the sufferer had to grind mold scraped from the wood of a ship into the yeast of fermented beer, and drink of it. The papyri do not reveal theories of reproduction. Three tests are detailed, however, to differentiate the sterile from the fertile woman.

First test: "Watermelon pounded and bottled with the milk of a woman who has borne a male child, make it into a dose to be swallowed by the woman. If the woman vomits she will bear; if she belches, she will never bear."

Second test: "Fumigate intravaginally with hippopotamus dung. If she urinates, or defecates, or passes flatus at the same moment she will bear; but if not, she will not bear."

Third test: The woman shall "water wheat and rye with her urine from two bags. If both grow she will bear; if the wheat grows taller it will be a boy; if the rye grows, it will be a girl. If neither grows she is barren."

The main difference between the Egyptian and the English versions of the study of sterility is that the ancient experiments tested solely the woman's fertility, while the modern variation tests both female and male. Perhaps one can postulate that the Egyptians four thousand years ago took it for granted that man was fertile. We know with certainty that, until recently, failure to conceive was ordinarily charged only to the woman.

In order to glean some knowledge of medicine, and especially infertility among the early Hebrews, we must turn to the Old Testament.

"Be fruitful and multiply, and replenish the earth," is the first commandment in the Bible.[4] Childlessness was regarded as the worst possible calamity.

The Talmudists[5] thought sterility and fertility depended upon the will of God. In the Midrash, Debarim Rabbah, a dictum of Rabbi Johatham is introduced: "There are three keys in the hand of God, which none of His creatures can dispose of, neither an angel nor a seraph. These are the keys of mortality, the key of the sterile, and the key of rains." In the Talmud, too, physical signs are being mentioned by which one can recognize a sterile woman; for example, one may assume a woman to be sterile "if she has reached the age of 20 and has no hair around the genitals, and has a male voice."

In Genesis, Sarah, explaining to Abraham her inability to give him an heir, says: "The Lord hath restrained me from bearing." Her suggestion of the immediate therapy was perhaps as pleasing [illegible] patriarch as it was effective; [illegible] substitution of the handmaid for [illegible]

---

[4] Old Testament, Genesis 1:28.

[5] Preuss, J.: [illegible] geschichte der Heilkunde [illegible] S. Karger, 1911; Allg. Med. [illegible]

Ishmael was born to Hagar the handmaid. Later we are told that, after thirteen more years of marital sterility, when Abraham was 99 and Sarah was 89, God told the elderly couple they would have their own child. Sarah laughed incredulously, and God countered with these words "Is anything too hard for the Lord?" Sarah was probably the most elderly primipara in history, for she was 90 when Isaac was born. To be sure, no one knows how short a year was in the age of the Patriarchs; it must have been decidedly briefer than the present Georgian calendar, since Sarah died at the age of 127 and Abraham at the age of 175.

The details of Rachel's reproductive history are also dealt with in Genesis. Jacob had been tricked into marrying Leah by Laban, his father-in-law. Rachel was the one Jacob chose. He finally married both and loved Rachel more than Leah. When the Lord saw this he made Leah fruitful and Rachel barren; Leah conceived, and was envied by Rachel, her sister. Rachel said unto Jacob, "Give me children, or I die." And Jacob's anger was kindled against Rachel, and he said, "Am I in God's stead, who hath withheld from thee the fruit of the womb?"

Jacob had no sterility problem himself, except perhaps in reverse, for he had made grand multiparas out of three wives simultaneously. Happiness comes to Rachel; she conceives, and bears Joseph. Rachel's life comes to a sad end with the birth of her second child, Benjamin. "And Rachel travailed and she had hard labour, and Rachel died."

From the sterility records of Sarah and Rachel we learn that women conceive at God's pleasure and that the cause of sterility is a "closed womb," for when God opens it, conception occurs.

In the Bible too one finds mention of the fact that the male may be the cause of a barren union.[6] "There shall not be a barren male or female among thee or thy cattle." Further elaboration is not made.

The Scriptures convey no clear-cut idea of embryology. In the Psalms[7] one reads "My frame was not hidden from thee, when I was made in secrecy, thine eyes did see my unformed substance, and in thy book all my members were written which in continuance were fashioned; when as yet there was none of them."

In Job[8] one finds: "Has thou not poured me out as milk and curdled me like cheese? Thou hast clothed me with skin and flesh and knit me together with bones and sinews." The original Hebrew is particularly vivid and powerful. The allusions are to the formation of the embryo in the uterus; clothed me with skin etc., elaborates the mysterious processes of human formation. God moulded the embryo which grew into the child.

In Chronicles[9] the same wonder is expressed: "As thou knowest not how the bones do grow in the womb of her that is with child," shows us that the mystery of embryology is not well understood.

Numerous workers in the field of infertility have added considerably to the present-day conception. Of these subjects Leake[10] stated that when women deviate from the simple law of nature in their manner of living, the vital powers of the body will be impaired. The poor woman who works hard and regularly eats plain, simple food is rarely troubled with the maladies of the rich and indolent women.

Turning to Greek medicine, one notes that, in the field of gynecology, Hippocrates[11] did not lose sight of the functional unity of the entire human being. He indicates the following treatment of sterility; the woman is sitting, and head and body are covered; a vessel with urine in which two or three pieces of red hot iron are submerged, is placed between her feet; the urine must be old and in a quantity of about ten pounds. Fumigation is continued until about thirty pieces of iron have been thrown into the urine. After the fumigation the head is rubbed with the urine, which is again heated in a brazier. The head is then lavaged with water. This operation is continued for seven days. The famous Greek physician was convinced that a woman cannot conceive if the orifice of the uterus is dry, or painful, or wrongly disposed, or turned to one side, or curved towards the anus, or folded on itself; if its swollen borders ride one on the other; or if there is a callosity that impedes emergence of the menstrual blood; or if the latter is scantier than desired and appears only from time to time. In these cases general fumigations must be made of the entire body, and a laxative must be given to cleanse the organism. After sufficient cleansing of the body, fumigations of the uterus are resorted to, with the use of laurel and cypress leaves cut in pieces. Warm lotions are applied frequently after the fumigations. The orifice of the uterus is dilated with tin probes, starting with small ones and straightening the orifice with increasingly larger ones. The probes should be moistened with some emollient fluid before use. They must be hollow at the posterior end, so that they can be adjusted into wooden handles of appropriate length. During this time the woman should drink sweet white wine of optimal odor, in which resin cut in short pieces, parsley, Ethiopian cumin seed and incense of the best quality have been boiled. This is taken in the morning in a fasting condition. Octopus cooked in sweet wine is also eaten. A cabbage broth is taken and the cabbage is eaten, white wine being drunk with it. No other food is taken at that time. Subsequently, if something resembling menstrual discharge emerges from the uterine orifice, drinking of the aforementioned wine is continued for one or two days; the use of the probe is omitted, and drug fumigations are used in order to provide bending of the uterus.

---

[6] Old Testament, Deuteronomy 7:14.

[7] Old Testament, Psalm 139:15-16.

[8] Old Testament, Job 10:10.

[9] Old Testament, Chronicles 11.

[10] Leake, J.: Medical Instructions Toward the Prevention and Cure of Chronic Diseases Peculiar to Women. London: R. Baldwin and H. Payne, 1781, vol. 1, p. 149.

[11] Littre, E.: Oeuvres completes D'Hippocrates. Paris: J. B. Balliere, 1853, vol. 8. Labandi, B.: Concepts of Hippocrates on the Fecundity and Sterility of Women, Revista de cir. de Buenos Aires, 1940. Ellinger, T. U. H.: Hippocrates on Intercourse and Pregnancy. New York: Schuman, 1952.

An analysis of the foregoing shows that Hippocrates[11] was well acquainted with many uterine causes of sterility. His knowledge of the morphologic and topographic variations of the cervix suggests the availability of an adequate gynecologic instrument at the time, in the form of a speculum or perhaps a vaginal valve. The cervical dilation described by Hippocrates[11] does not differ too much from the method in modern use.

A careful description is given of a normal uterus from which the menstrual flow is lacking or occurs only in small amounts and at long intervals. Then, says Hippocrates, it is necessary to determine with what disease the uterus is affected, or whether the general condition of the woman is responsible for her failure to conceive. Treatment should be started with the most active remedies if circumstances require, and terminate with the most gentle ones until the uterus appears sufficiently purged. If menstruation does not appear after a reasonable period of treatment with drinks and remedies, the opening is softened and opened, so that vapors of fumigants and emollients can enter it. When these methods produce a good effect, remedies for purgation of the uterus are added, starting with those which have resolvent action and passing to the strongest ones, with later return to those of resolvent effect, or the aromatics, as the majority of the emollient remedies corrode or irritate the orifice. When the uterus is dry and in good position, coitus is carried out. The use of emollient fumigations as advised in this paragraph is considered absolutely ineffective at present.

The pathologic aspects of the cervix and uterus are carefully described. If the cervix is ulcerated and phlyctensiform, anise and goose fat are dissolved in rose oil; a piece of ox meat is cut, thicker than a thumb and of considerable length, rubbed with the above preparation and introduced towards the ulcerated cervix at its thin end, with a thread attached to it.

If the uterus is hard and the woman does not conceive, pleasant wine is mixed with water, fennel root and rose perfume; the mixture is made in a new jar, the wine is removed, the cover of the jar is pierced, a cane is put in and fomentation is done. The cane, together with the cover of the jar, is removed in order to avoid burns. After the fumigation a squill pessary is applied until the woman states that the orifice is soft and wide.

Hippocrates[11] stated that a large amount of sperm is needed for fecundation; this conception is entirely inadmissible at present, as it is known that a single spermatozoon is sufficient to produce fecundation of the ovum. Hippocrates' theory was that, if the sperm escapes, the pathologic condition is located in the uterine orifice. If the orifice is closed, it must be opened by means of lead dilators and sounds; emollient fumigations are applied, and the uterus is purged with pessaries that diminish the size of the organ and make it assume a proper position. Subsequently, fomentations suitable for the disease are used. If the uterus is deviated and impedes entrance of the male sperm, chromatic fumigations are used, and subsequently the uterus is displaced gently with the finger away from the os ischium. Once softened, the uterus is maintained in a good position by means of lead dilators and sounds.

The conception that a possible cause of sterility is remoteness of the cervix from the seminal reservoir in the posterior fornix is still valid; and the terms of "right lateroversion" and "left lateroversion" are used, and digital or manual reduction is still used, though in maintenance of the organ's position the lead sounds have been replaced by different types of pessaries.

Testing blood was important. The menstrual blood of a sterile woman should be examined in order to determine whether it is biliary or pituitous; for this purpose the blood is mixed with sand and left to dry in the sun. If the blood is bilious the mixture will assume a yellow color, and if it is pituitous, flakes will be observed. This supplements a statement elsewhere, that if the body of a woman is in poor condition the menstrual blood is bilious, very dark, at times black and brilliant; emerges in small amounts, and coagulates promptly. In this condition the seed of the woman is enervated or alters that of the male, and conception will not take place. Hippocrates[11] is known to be the creator of the humoral doctrine, and he assumes the existence of the four humors, namely, blood, mucous, bile and black bile. The term "pituitous menstrual flow" signifies that the menstrual blood is mixed with a large amount of mucus. Generally the term "pituitous" is considered synonymous with "mucous." The mucous secretion of the uterine cervix originates from the muciparous glands of the endocervix. This physiologic secretion forms the so-called mucus cervical plug, and constitutes a true barrier against ascending septic infection; it may increase to a variable extent, owing to various causes, and give rise to leukorrhea. This mixture of menstrual blood and leukorrhea is termed pituitous menstrual flow. Hippocrates[11] interprets leukorrhea differently from the present conception, stating that when the female seed drains constantly the woman has no desire for cohabitation, will not conceive and suffers from lumbar and sciatic pain, together with weakness, lassitude and displacement of the uterus. His "continuous flow of female seed" undoubtedly refers to leukorrhea.

The following advice is given to women desiring to conceive: "Take seven berries of ivy, in old wine, every month until the end of menstruation, and apply a pessary of pomegranate cortex boiled in wine, or of alum powder incorporated in wool during the day until sunset, when the pessary is removed and a lavage with perfumed wine is performed." This is done until the end of the menstruation; this is undoubtedly the time when conception takes place most easily, the uterine orifice being wider open. This conception does not agree with the modern one that fecundation is most likely to occur between the fourteenth and the twenty-second day of the menstrual cycle.

Hippocrates[11] speaks of a female seed twenty-one centuries before the discovery of Graaf's ovarian follicle, and was therefore on the right track, despite the prevailing ignorance of the intimate process of fecundation. He believed that if a woman cannot retain the male sperm and if the latter is expelled, impregnation will not take place. This is contrary to the present knowledge that one spermatozoon is sufficient to produce fertilization. Hippocrates[11] shows considerable knowledge of uterine causes of sterility; he assigns considerable importance to uterine displacements, and cervical stenosis as a cause of sterility was well known to him. Except for asepsis his treatment is still applicable. Leukorrhea was known to him as cause of sterility and is still recognized as such, in that the alkaline secretions of the muciparous glands of the cervix diminish the acidity of the vaginal medium and, to a variable extent, the vitality of the spermatozoa. Many etiologic and therapeutic conceptions of Hippocrates[11] have been completely discarded, but, in view of the fact that scientific truth is amenable to development and perfection, one should consider the value that will probably be set on today's knowledge twenty-one centuries hence!

ABRAHAM BERNSTEIN, M.D., F.I.C.S.
and HENRY C. BERNSTEIN, M.D., A.I.C.S.
San Francisco, California

Fortunately for us, we only know the plague by report, much less are we acquainted with the traditional notions relative to its origin, and the spectral visitations with which our remote ancestors are said to have been warned of an approaching plague or pestilence. The vampires and goblins connected with pestilential diseases have long been out of fashion; nevertheless, examples might be adduced to show that, previously to the attack of the plague, or other epidemical diseases, a temporary delirium has affected the population, sufficiently to account for the conjuring up of these spectral delusions.

—*William Wadd,* circa *1827*

New Books

Books Received.—The following books have been received by the Editor; they will be reviewed critically as space and facilities permit. Omission of more extended review, however, is not to be taken as criticism of the merit of the book.

Man in a Cold Environment: Physiological and Pathological Effects of Exposure to Low Temperatures. (Monograph No. 2 of Physiological Society series.) By Alan C. Barton and Otto G. Edholm. London: Edward Arnold, 1955; Baltimore: The Williams and Wilkins Company, 1955. Pp. 273. *Reviewed in this issue.*

Nursing Practice and the Law. By Milton J. Lesnick and Bernice E. Anderson. Philadelphia: The J. B. Lippincott Company, 1955. *Reviewed in this issue.*

Joint Ligament Relaxation Treated by Fibro-Osseous Proliferation. By George Stuart Hackett. Springfield, Ill.: Charles C Thomas, Publisher, 1955. Pp. 97, with 17 illustrations. *Reviewed in this issue.*

The Blood-Brain Barrier, with Especial Regard to the Use of Radioactive Isotopes. By Louis Bakey. Springfield, Ill.: Charles C Thomas, Publisher, 1956. Pp. 154, with 32 illustrations. *Reviewed in this issue.*

Current Therapy, 1956. Edited by Howard F. Conn. Philadelphia: The W. B. Saunders Company, 1956. Pp. 632.

The Doctor's Legacy. Edited by Laurence Farmer. New York: Harper & Brothers, Publishers, 1955. Pp. 267.

Pathology. By Peter E. Herbut. Philadelphia: Lea & Febiger, 1955. Pp. 1227, with 1,378 illustrations in 661 plates, including 6 in color. *Reviewed in this issue.*

Sachs Essays. By Ernest Sachs. Hamden, Connecticut: The Shoe String Press, 1955. Pp. 118, with frontispiece (portrait of author).

Color Atlas of Pathology. U. S. Naval Medical School, Bethesda, Md. Pp. 450, with 1032 illustrations. *Reviewed in this issue.*

Antimicrobial Therapy in Medical Practice. By Harrison F. Flippin and George M. Eisenberg. Philadelphia: F. A. Davis Company, 1955. Pp. 284. *Reviewed in this issue.*

Clinical Neurosurgery: Proceedings of the Congress of Neurological Surgeons, New York, 1954. Baltimore: Williams and Wilkins Company, 1955. Pp. 173. *Reviewed in this issue.*

Magic, Myth and Medicine. By D. T. Atkinson. Cleveland and New York: The World Publishing Company, 1956. Pp. 319.

Surgery of the Sympathetic Nervous System. By A. L. McGregor. Bristol: John Wright and Sons, Ltd., 1955. Pp. 192. *Reviewed in this issue.*

Disease of the Chest. By E. Corwin Hinshaw. Philadelphia: The W. B. Saunders Company, 1956. Pp. 727, with 288 illustrations.

Clinical Disorders of Hydration and Acid-Base Equilibrium. By Lewis G. Welt. Boston: Little, Brown & Company, 1955. Pp. 262, with 11 illustrations.

Clinical Laboratory Diagnosis. By Samuel E. Levinson and Robert P. MacFate. Philadelphia: Lea & Febiger, 1956. Pp. 1216, with 244 illustrations and 13 plates, 11 in color. 5th ed.

The Cervical Syndrome. By Ruth Jackson. Springfield, Ill.: Charles C Thomas, Publisher, 1956. Pp. 130.

Blood Volume Determinations in Surgical Practice. By Olla Wiklander. Acta Chirurgica Scandinavisa Supplementum 208. Stockholm: Acta Chirurgica, 1956. Pp. 136, with 10 illustrations and 37 tables.

BOOKS REVIEWED

The Biologic Effects of Tobacco. Edited by Ernest L. Wynder. Boston and Toronto: Little, Brown & Company, 1955. Pp. 215.

"The Biologic Effects of Tobacco" is a timely publication summarizing the present knowledge of tobacco. The editor has been successful in collecting most prominent collaborators. The book is divided into numerous chapters, discussing chemistry, pharmacology, cardiovascular system, neoplastic *diseases, the gastrointestinal tract, allergy* and "cause and effect." The theoretical chapters are well written and easy to understand.

Chapter 4, on neoplastic diseases, written by the editor, is rather debatable. It is, of course, a difficult task to discuss objectively so controversial a subject as the influence of tobacco upon cancer of the respiratory tract. In this reviewer's opinion, too much emphasis has been placed upon the literature proving a connection between tobacco and carcinoma of the bronchus. Well documented papers like those written by Hueper, which are not in complete agreement with this theory, are just briefly mentioned.

The last chapter, "Cause and Effect," by E. Cuyler Hammond, is an interesting, almost philosophical dissertation.

All in all, the book is well written, It is a "must" in the library of anybody who is interested *in the problem of the potentially carcinogenic* effect of tobacco.

Werner F. Eisenstaedt, M.D.

Color Atlas of Pathology. Bethesda, Md.: U. S. Naval Medical School, 1955. Pp. 450, with 1032 illustrations.

This volume covers the endocrine system (including the pituitary, thyroid, parathyroid, adrenals, pancreas), gynecology and obstetrics, including the reproductive organs, the breast, the male genital tract and the skin.

In the section on endocrines, a complete discussion of the pathologic entities precedes the photomicrographs in color of the normal histologic picture. Pathologic sections are then shown with an abbreviated history of each individual case. Thoroughly integrating the history with the pathologic photomicrographs makes the color atlas a complete pathologic-physiologic text. Roentgenograms, facial photographs, photographs of gross pathologic specimens, anatomic sketches and classifications of pathologic entities make this volume invaluable. This book is a "must." Such color atlases done with such meticulous care, should be in every doctor's library, whatever his specialty.

Jerome J. Moses, M.D.

The Blood-Brain Barrier, with Special Re*gard to the Use of Radioactive Isotopes.* By Louis Bakay. Springfield, Ill.: Charles C Thomas, Publisher, 1955. Pp. 154, with 10 tables and 32 illustrations.

This brief monograph discusses the interesting subject of the blood-brain barrier. It is subdivided into four parts, the first part (Chapters 1-3) includes a *historical introduction*, and deals with the anatomic location and physiologic nature of the blood-brain barrier. The second part (Chapters 4-6) discusses concentration of radioactive isotopes, p-32, in the central nervous system. Part 3 (Chapter 7) discusses the development of the blood-brain barrier. The last part (Chapters 8-11) deals with pathologic changes in the premeability of the blood-brain barrier.

Anyone interested in this subject will know the amount of work the author has done in this field. The book is objectively written, presenting everybody's opinion on this debatable subject. It might have been less confusing if the author had stated, rightly or wrongly, his own opinion. The final chapters, well demonstrated by photographs, are an excellent presentation of the present status of the use of radioactive isotopes in the diagnosis of brain lesions.

All in all, this is an interesting monograph, that can be recommended to the student of neurosurgery.

Werner F. Eisenstaedt, M.D.

Surgery of the Sympathetic Nervous System. By A. L. McGregor. Bristol: John Wright and Sons, Ltd., 1955. Pp. 192.

This is a well-organized and complete presentation of the sympathetic nervous system from the anatomic and physiologic standpoints and the indications and technics of its surgical removal. The book is well illustrated, but some of the diagrams are overstyled and simplified. In an attempt at completeness of presentation the author has presented some questionable indications for sympathectomy. Though he is conservative in his presentation, he may mislead the casual reader into thinking that the so-called biliary, intestinal and renal syndromes are definite indications for a surgical attack on the sympathetic nervous system. Nearly one-fourth of the book (46 pages) is devoted to hypertension, perhaps a disproportionate amount in view of the current tendency to substitute medical treatment for sympathectomy.

The great value of this book lies in its thorough presentation of the surgical anatomy aspects and the complete and clear description of the technics of various sympathectomies. Many practical pointers are given in surgical technic and avoidance of complications. The following quotation best expresses the spirit of the work. "It is a sound general rule in surgery that it is not the accident itself which is serious but the failure to appreciate that it has occurred." The author is referring to possible injury to the thoracic duct in left cervicothoracic sympathectomy, but throughout the book he continues to emphasize precautions and safeguards in surgical technic.

HAROLD C. VORIS, M.D.

Man in a Cold Environment: Physiological and Pathological Effects of Exposure to Low Temperatures. By Alan C. Burton and Otto G. Edholm. Baltimore: The Williams and Wilkins Company, 1955. Pp. 273.

This little book is a coherent review of contemporary knowledge of the stated problem, one of special interest to physiologists and students of physiology, as well as others, including surgeons, who are concerned with the effects of cold.

Such a monograph can be a highly useful and even an important contribution if well done; this one, within its limits, is extremely well done. It originated from a desire to save from oblivion some of the wartime research done by the United States, Canada and British military services. In addition to selecting what they consider the most important contributions from the war reports, the authors have examined the other literature through 1951 and added subsequent information, the latter from interviews, a tour of laboratories and other direct sources.

They modestly point out that their book is not primarily for specialists; nevertheless, these may well be just the workers who will find it most valuable, as the number of war reports cited and abstracted is not inconsiderable. In addition, the careful treatment of individual physiologic points merits the closest attention. It would have been helpful, however, if the authors had more clearly established the final date of their own work, which appears to bring the subject up to 1953 (see p. 242).

The contents fall into several parts. As the introduction explains, "In the first the physical and physiological problems involved in maintenance of a thermal steady state are discussed, with a scheme for assessing the thermal demand of the environment. In the second section the ways in which animals have met the problem are described, first in general terms, then in some detail as to physiological mechanisms in man. A section follows describing the consequences that result if heat balance is not maintained, leading eventually to pathology. Finally a chapter has been written suggesting the lines of future research . . ."

Two chapters will have special interest for surgeons, especially the many who are active in experimental surgery. The first is the chapter on hypothermia and resuscitation, with a succinct report and evaluation of recent experiments. The second is the chapter on local injury from cold, which includes a detailed review of the treatment of frostbite.

A large part of the book is concerned, of course, with biophysical and other theoretical problems, and these are presented with unusual clarity. In fact, one should not neglect to point out to the authors' credit that their whole exposition is extremely well written, a distinction that should not be overlooked in judging its final usefulness.

R. J. L.

Pathology. By Peter E. Herbut, Philadelphia: Lea & Febiger, 1955. Pp. 1227, with 1378 illustrations and 4 color plates.

Herbut's textbook on pathology is, as the author writes in the preface, intended for the student of medicine. It is, no doubt, a tremendous task to present knowledge of pathology in one volume. On the whole, the author has been successful.

The book follows, in general, other textbooks in pathology. After a brief orientation and historical review, there follows a rather abbreviated chapter on the autopsy. Chapters 3 to 7 deal with the principles of general pathology. There is a chapter on anomalies in general, degeneration, inflammation, physical disturbances and tumors.

Exception must be taken to the statement in the chapter on tumors that "the group doubtlessly represents an heterologous collection of disorders rather than a *distinct single* entity." This statement seems to be contradicted by the definition given by the author on the same page.

Pathologic changes in different organs and *systems are next* discussed. One is aware of the fact that a logical classification is almost impossible; but it seems rather strange to find, in a textbook for students, leishmaniasis and trypanosomiasis discussed in the chapter on the reticuloendothelial system, while malaria follows hemophilia in the chapter on disease of the blood. It appears to this reviewer that a separate chapter on parasitic infestations would have been more logical.

Exception is also taken to the broad conception of "tumors" in the chapters on special pathology. For instance, in the chapter on the thyroid, toxic hyperplasia is listed under "tumors," and in the chapter dealing with diseases of the breast, cystic hyperplasia is *also listed among tumors. This is likely to* create a wrong impression in the mind of the student who does not have the author's broad knowledge of the subject.

The book is written in Dr. Herbut's usual easy, readable style. The illustrations are carefully selected and beautifully reproduced. Each chapter is followed by a review of the important literature. All in all, the book represents a summary of the experiences and knowledge of an excellent pathologist. There is a question in the mind of this reviewer, however, as to whether it is the ideal book for the student who approaches the subject without any previous knowledge.

WERNER F. EISENSTAEDT, M.D.

Clinical Neurosurgery: Proceedings of the Congress of Neurological Surgeons, New York, 1954. Baltimore: Williams and Wilkins Company., 1955. Pp. 173.

The second volume of *Clinical Neurosurgery* continues the pattern of the first. Dr. Kenneth G. McKenzie was the guest of honor at the 1954 Congress of Neurologic Surgeons. The first five chapters present the five subjects on which this *noted neurosurgeon* addressed the Congress. The chapter on intracranial astrocytomas is a follow-up study of the postoperative survival periods of 61 patients for intracranial astrocutomas. The average duration of life in 35 surviving patients with supratentorial astrocytomas was four and three-tenths years; for 15 with infrafrontal astrocytomas it was twelve and *six-tenths years.*

In the chapter on acoustic neuromas the diagnosis of these lesions is thoroughly discussed, but the special interest of the chapter lies in the author's description of his technic *of surgical removal. As he points out,* treatment of these tumors is no longer concentrated in a few clinics, and few younger neurosurgeons will have the experience that the author has had and be able to report 100 cases.

Spasmodic torticollis is briefly discussed, and Dr. McKenzie's surgical management is outlined. He especially emphasizes the importance of division of the motor root of the first cervical nerve and of a collateral branch to this nerve from the spinal accessory nerve. It is necessary to divide or retract the most superior attachment of the dentate ligament in order to visualize the motor root of the first cervical nerve.

McKenzie was one of the pioneers of differential section of the vestibular portion of the eighth cranial nerve for Meniére's syndrome. He counsels conservatism, however, and advises operation only in cases of severe involvement. He advises against medication and special diet. Trigeminal tractotomy (Sjoqvist) has been performed on 41 patients. Some involvement of the spinothalamic tract occurred in 15 patients.

The last two chapters of the book are reports of symposiums on cervical trauma and the medicolegal aspects of injury to the head. Not only are these chapters valuable to the neurosurgical specialist; they are worth the attention of anyone interested in trauma and *its medicolegal aspects.*

HAROLD C. VORIS, M.D.

Current Concepts in Digitalis Therapy. By Bernard Lown and Samuel A. Levine. Boston: Little, Brown & Company, 1955. Pp. 164, with 21 illustrations.

This monograph presents the authors' points of view on the modern conc digitalis therapy. In their introduc *marks they state: "Translated into* this means that digitalis is useful, with but few exceptions, during the entire course of the evolution of cardiac failure." In discussing the attitude of MacKenzie and Lewis, they further state: "Digitalis was therefore restricted to patients with atrial fibrillation and a rapid ventricular response. The larger number of patients whose failure was accompanied by regular rhythm were not treated with digitalis. Such a view is no longer tenable."

The second chapter is concerned with the mode of action and clinical uses of digitalis, the various products and dosage. The chapter on digitalis intoxication is particularly well written. The material in the chapters concerning the electrolytes (particularly potassium) is equally good. The remainder of the book is devoted to paroxysmal atrial tachycardia and a "digitalis tolerance test."

"The purpose of the test is to ascertain the degree of digitalization and myocardial sensitivity to digitalis in patients whose digitalis status is in doubt." Their experience of 20 tests of 18 patients is recorded.

This book should be well received and properly appreciated. Perhaps all the readers will not find themselves in accord with their generous use of digitalis or the dosage for nearly all patients with cardiac failure and edema. Some readers may feel that less digitalis and the employment of other supplementary diuretic therapy might be more judicious. They may be critical of some of the case reports of the patients in the "digitalis tolerance test" group.

C. C. MAHER, M.D.

Living Bone in Health and Disease. By I. R. Stein, R. O. Stein and M. L. Beller. Philadelphia: The J. B. Lippincott Company, 1955. Pp. 510, with 387 illustrations.

This book is exactly what the publishers have called it, "a dynamic concept of the disease and repair of bone." Bone is a living tissue, not an inanimate substance like concrete in the sidewalks we walk on every day. It is filled with living cells, that are constantly at work, restoring bone that has been damaged by injury or disease. Bone is, indeed, an organ of the body.

The authors of this book have long been interested in the metabolic processes that influence or regulate bone repair. They have carried on research in the laboratory and in the hospital, and have added to surgeons' knowledge of bone in health and in disease. This is a reference book, not merely a classroom textbook. The authors have shown that bones are also affected by other organic systems. They speak with authority of the influence of the endocrine glands upon the bones of the human body. The chapters dealing with this subject alone are worth the full price of the book.

The illustrations are carefully selected. The printing is easy to read, and the composition is excellent. The bibliographic listings at the end of each chapter are exceptionally appropriate. This is a contribution to the literature that will be valuable for many years to come. All who are interested in calcium and phosphorus metabolism in bone formation, bone injury or bone disease, including the internist, the orthopedic surgeon, the physiologist and the pathologist, will find this book most helpful.

EDWARD L. COMPERE, M.D.

Nursing Practice and the Law. By Milton J. Lesnik and Bernice E. Anderson, R.N., Ed. D. J. B. Lippincott Company, 1955. 2nd ed.

A number of years ago, a learned member of the bar in New Jersey and one of the country's leading educators in nursing prepared a first edition of this book under a somewhat different title.

The second edition is an amplification of the earlier valuable volume. It is considerably improved, since nothing was lost that appeared in the earlier edition and a good deal has been added to it.

For the layman looking for escape literature, "Nursing Practice and the Law" is not recommended reading, but for the administrator or instructor in any school of nurses, convinced that no good training school should be without a course in nursing jurisprudence, it is indispensable. Nowhere else will the hospital administrator or legal advisor for a hospital or nurses' association find so comprehensive a collection of important information as is contained within the covers of this book.

For the reader who is not a member of the legal profession, the legal principles are clearly set forth in nontechnical language. For the lawyer, the principles are supported by footnotes containing innumerable citations to reported cases, which would save the attorney hours of time in research.

The ambitious nurse, desirous of teaching herself all that she will ever need to understand about legal principles applicable to the nursing profession, need look no further; the answers are all in this book. It will probably also help her to realize when she needs the advice or services of a lawyer.

This same volume includes a detailed summary of the growth and scope of state control over the nursing profession, which could be of considerable interest to anybody interested in the historical development of legislation pertaining to the regulation of the nursing profession. If the reader would like to be able to distinguish between a good nursing practice act and a bad one, one of the numerous indices (consisting of an analysis of various nursing practice acts) will enable him to do so. All in all, this is a concise reference book for almost any conceivable problem that may arise in connection with the nursing profession.

The authors are to be commended for the painstaking manner in which they have condensed a complicated subject into an accurate, understandable text which should be included in every library that needs a textbook on this subject.

PHILIP E. RINGER, J.D.

Joint Ligament Relaxation Treated by Fibro - Osseous Proliferation. By George Stuart Hackett. Springfield, Ill.: Charles C Thomas, Publisher, 1955.

This book is divided into two parts. The first part discusses ligamentous disabilities, and the author devotes part of his work to an explanation of the etiologic factors, pathologic picture, symptoms, diagnosis and history of the various ligamentous conditions which, in his opinion, can be treated by his technic.

He gives a résumé of treatments of the lower part of the back and uses 17 illustrations to demonstrate his approach to the treatment and to his study of the tissues after treatment.

The second part of the book consists of a discussion of the diagnosis and treatment of diseases of the cervical and upper dorsal portions of the spine, the lower dorsal and lumbar segments and the lumbosacral and sacroiliac joints. In addition, the author discusses other ligaments in the body.

There is a rather extensive paragraph that cites articles covering various phases of this work, and the author attempts to demonstrate his own theories by means of a number of case histories, in which he gives a thorough résumé of the complaints and the results he obtained by employing his method of treatment.

This book will make good reading for physicians and for those interested in orthopedics and traumatology.

H. E. TURNER, M.D.

Antimicrobial Therapy in Medical Practice. By Harrison F. Flippin and George M. Eisenberg. Philadelphia: F. A. Davis Company, 1955. Pp. 284.

In view of the importance of the antibiotics in modern surgical practice, the surgeon will find this contribution a timely and useful addition to his bookshelf. Its timeliness is surpassed only by the periodical literature, which cannot, of course, supply the information in a compact and handy form for reference and study. The authors have attained this result by omitting case records, as well as the controversial and theoretical questions discussed in the current journals. On the other hand, the statistical treatment and tables, which form an important feature of the book, represent cases evaluated over a period of seventeen years at the Philadelphia General Hospital, with which the authors are affiliated.

It is evident that they have thoroughly combed the literature to produce a book that has the merits both of a monograph and of a handbook. Both these functions are of the utmost practical importance to the practicing physician and surgeon. This type of monograph can digest timely material that would not find its way into a new edition of a standard text for some years. As a handbook, with its lucid arrangement and tabular presentation, it will continue to be useful for reference after its contents have been digested.

The reader's especial attention should be called to a further point: The authors are aware that the antibiotics have presented the profession with a definite type of therapy attended by its own philosophy and pitfalls, one which does not *per se* replace other older types of treatment. Thus there are prominent warnings against the risk of complications, such as superinfectio [illegible] ue t [illegible], selective decimation of the bod [illegible] and also against the purel [illegible] antibioti [illegible]

Chapters include: systematic description of the different agents; combinations and adjuvants; laboratory aspects; complications; diagnosis; treatment of special diseases; prophylactic use; prospectus. The information is not thoroughly documented, but the references to the literature amply outdo the authors' own claims. Much information is summarized in tables, such as dosage, distribution in the body, *in vitro* spectra, indications for infections of the gastrointestinal and urinary tract, and a partial (but extensive) list of antibiotic preparations on the market.

R. J. L.

About one hundred years ago there lived in Dresden a famous physician—Johann Ludwig Choulant. He was most skilful in taking a patient's history and in making a careful physical examination. So great, indeed, was his ability in making diagnoses that he felt no need whatever for some of the newfangled devices that were being introduced into medicine. One day a specimen of urine containing pus cells was placed under the microscope and he was asked to examine it. He looked in, but said with a smile, "you are seeking the solution of the matter where there is nothing to find." He then proceeded to tell his assistants that the correct way to diagnose a patient's malady was to note carefully his symptoms and examine him minutely. He discouraged these new attempts to solve problems which he said had no solution, and was most outspoken in his attacks on this new learning.

But Choulant's young assistants were continually finding things with their microscopes. The old master gradually bent more and more and finally had to give way to the "new learning," but he never sympathized with the innovations, and his outspoken criticism provoked a bitter hostility which saddened his later years.

Such unhappiness, however, is the fate of those who throw themselves into reckless combat with the steady, relentless progress of science. No sane man today would oppose the use of instruments of precision in the diagnosis of disease, and every life-insurance agent knows that the microscope daily gives us details of a patient's condition which would escape the attention of the most acute observer who relied entirely upon physical diagnosis.

—*Major*

Abstracts from Current Literature

Effects of Experimental Hypothermia on Vital Organs. Knocker, P., Lancet 2:837, 1955.

This publication from the University of the Witwatersrand Medical School, Johannesburg, reports the results of a study undertaken to determine the histochemical effects of hypothermia on the liver, kidney and adrenal gland in the dog.

Before the induction of hypothermia, biopsy specimens were taken from these three organs. In this series of hypothermic dogs the chief abnormalities observed were accumulation of fat in the liver, kidney and adrenal glands; depletion of glycogen in the liver, and vacuolation of the granular cells of the zona reticularis of the adrenal cortex. The implications of these delicate histochemical changes may well be extensive.

It is important to observe the similarity that exists between the tissue changes induced by hypothermia and those described by Selye (1946) as bodily reactions to stress. There is no proof that the changes are due to anoxia, but much evidence has been gathered to show that cellular anoxia can lead to similar changes.

The objective of hypothermia has been to diminish cellular metabolism to a point at which temporary occlusion of the circulation can be sustained. The tissue changes observed in this study and attributed to the accepted degree of hypothermia cast serious doubt on the wisdom of utilizing cold, with its potential for grave tissue damage, as a preparation for the ordeal of anoxia during operations on the heart.

The article is illustrated by 16 excellent color photomicrographs.

THOMAS WILENSKY, M.D.

A New Method for Surgical Correction of Transposition of the Aorta and Pulmonary Artery. Baffes, T. G., Surg., Gynec. & Obst. 102:227, 1956.

During the past three years, after experiments on approximately 150 dogs, the conclusion was reached that the best approach to correction of transposition of the aorta and pulmonary artery is transposition of the major veins at the base of the heart, since most of the variations encountered can be taken care of in this fashion. Lillehei and Varco demonstrated that patients with transposition of the aorta and pulmonary artery live long enough, with the right pulmonary artery occluded, to permit doing the necessary venous anastomoses. Barring undue delay, congestion of the right lung during occlusion of its artery and veins should not occur. Transfer of the veins instead of the aorta and pulmonary artery would eliminate the necessity for transferring the coronary arteries from the pulmonic to the systemic circulation. Simple transfer of the right pulmonary vein to the right atrium gave an unsatisfactory degree of clinical improvement. Transfer of the superior vena cava to the left atrium, in conjunction with transposition of the right pulmonary veins to the right atrium, was completed in 1 instance by using a temporary polyethylene shunt between the right atrium and the superior vena cava while the latter was being transposed to the left atrium, and in another by utilizing a homologous aortic graft between the superior vena cava and the left atrium. Both patients died of obstruction of the superior vena cava in the immediate postoperative period — apparently because the superior vena cava is readily compressed by the right main bronchus, the right pulmonary artery and the transposed right pulmonary veins, as it passes between these structures to the left atrium. Therefore the final operative procedure, here as described in detail, was worked out. A thoracotomy is performed through the right fifth intercostal space, and the right pulmonary artery, both right pulmonary veins and the inferior vena cava are dissected free. The pericardium is opened during the dissection, which exposes the lateral aspect of the right atrium. A curved coarctation clamp is placed on the lateral aspect of the inferior vena cava in such a way that the flow of blood through the vessel into the right atrium is not occluded. A longitudinal incision is made in the lip of the inferior vena cava, held within the coarctation clamp, and the larger end of a suitable homologous [illegible] raf [illegible] omosed to the edges of the incision. A continuous everting type of arterial suture is used in order to decrease thrombus formation. After completion of the anastomosis, an angulated ductus forceps is placed near the open end of the aortic graft and the curved coarctation clamp is removed from the inferior vena cava. The open end of the graft is trimmed and beveled to fit against the proposed left atrial stump of the right pulmonary vein. The right pulmonary artery is then occluded with umbilical tape, and the right pulmonary veins are divided between straight coarctation clamps in such a way that both pulmonary venous ostia open upon a single pedicle. The placing of straight coarctation clamps before division of the pulmonary veins is important. The distal coarctation clamp is placed longitudinally, so that it can later be easily apposed to the side of the right atrium. The proximal coarctation clamp is placed horizontally, which facilitates its apposition to the angulated ductus clamp across the open end of the aortic graft. The open end of the aortic graft is then sutured to the stump of the left atrium with a continuous everting suture. The proximal coarctation clamp and the angulated ductus clamp are removed; this permits blood to flow from the inferior vena cava into the left atrium. Note that the attachment of the inferior vena cava to the right atrium has not yet been divided, so that there is no danger of imbalance of the systemic and pulmonic circulations. A portion of the lateral wall of the right atrium is then excluded within a curved coarctation clamp and incised longitudinally. The distal clamp is apposed to this incision, and the right pulmonary veins are anastomosed to the edges of the incision. The coarctation clamps are removed and the occluded right pulmonary artery released; then the patient is allowed to recover from the occlusion of the right pulmonary artery, before separation of the inferior vena cava from the right atrium is undertaken. A few moments later, the attachment of the inferior vena cava to the right atrium is divided between angulated ductus clamps, forcing the flow of blood from the inferior vena cava through the aortic graft and into the left atrium. The stumps of the inferior vena cava and the right atrium are oversewn with continuous sutures and released. The right lung is allowed to expand, and the thoracotomy is closed in the usual manner.

Twelve dogs were subjected to the proposed operation "in sham" and in all instances proved apparently satisfactory. In order to determine the reaction of the graft to growth, the sham operation was performed on a puppy weighing 8 pounds (3.6 Kg.). The dog has now grown to a body weight of 40 pounds (18.1 Kg.), and venous angiographic study reveals adequate functioning of the graft without significant narrowing. The operation was given a clinical trial on a patient 1 year old, who was admitted to the hospital with a history of cyanosis since birth. During the following year the symptoms and signs increased in severity, and angiocardiograms established the diagnosis of transposition of the aorta and the pulmonary artery. Definite improvement in color was noted in the immediate postoperative period, but mild cyanosis persisted at the time of discharge and was apparent with exercise when the child was studied one month later. Venous angiograms taken three months after the operation showed that the graft was functioning well and that the blood from the inferior vena cava was emptying adequately into the left atrium. The patient had suffered no further episodes of unconsciousness and was beginning to walk for the first time in her life. There was marked improvement in mental alertness also. The size of the heart has decreased, and cardiac failure has not recurred. Should any significant symptoms persist after such an operation as this, it is planned to extend the transposition of the major veins to the heart by performing a second-stage thoracotomy on the left side and inserting a homologous aortic graft from the left innominate vein to the left atrium, in order to transfer the blood of the superior vena cava to the pulmonic circulation. An attempt could be made at the same time to transfer the left pulmonary veins to the coronary sinus.

WARREN A. YEMM, M.D.

Right-Sided Approach to Cancer of the Esophagus. Hurley, G. A. P., Surg., Gynec. & Obst. 5:768, 1955.

In the face of a noticeable tendency toward pessimism with regard to cure of cancer of the esophagus, surgeons should attempt to extend the excision. In addition to the local posterior mediastinal group of lymph glands, those below the liver about the celiac axis artery and its branches and those in the gastrohepatic omentum should be included. These glands are often involved in tumors in the middle and lower portions of the esophagus, which comprise the majority of cancer sites in that organ. The glands most likely to be missed are the subhepatic group, largely because of their inaccessibility.

The purpose of this article is to advocate greater use of a right thoracoabdominal incision combined with a simple turning of the thorax made possible by the rotational capacity of the lower dorsal and lumbar portions of the spine. Such a maneuver gives good access to the whole length of the thoracic part of the esophagus and stomach and, because of the turning of the liver upward into the chest, made possible by the incision of the diaphragm, gives excellent exposure of the important lymph glands beneath the liver.

The technic advocated is based upon the fact that, with the pelvis fixed in the supine position, it is possible to rotate the chest almost 90 *degrees into the lateral position.*

The patient is placed supine on the table, with the right buttock elevated about 4 inches (10 cm.) on a sandbag. The pelvis is fixed to the table in this position with a wide adhesive band. The chest is then rotated into the lateral position by pulling the right shoulder forward and to the left, with a wide band of adhesive attached to the back of the right shoulder (spine or scapula). This band is then fixed, at a convenient point to the table by the anesthetist. The right side of the chest is opened through the bed of the resected seventh rib. The tumor is examined, and if radical resection is decided upon the esophagus is mobilized for as much length as required by going at least 3 inches (7.5 cm.) above the tumor and down to the hiatus in the diaphragm. Every effort is made to remove the local mediastinal lymph glands in line with the mass.

The thoracic incision is then temporarily covered with a towel; the fixing shoulder band is detached from the table, and the chest is allowed to rotate back into the supine position. The thoracic incision is now prolonged through the costal arch and across the right rectus abdominis muscle to the midline above the umbilicus. The right hemidiaphragm is divided from the front almost to the back of the chest, care being [illegible] not to injure the inferior vena cava. The avascular left lateral ligament of the liver is divided, the left lobe of the liver is turned to the right, and the whole organ is rotated upward into the right side of the chest, where it is held by an assistant. The abdominal inch or so of the esophagus and the whole length of the stomach are now laid bare. Both curvatures of the stomach are mobilized, starting about 1 inch (2.5 cm.) proximal to the pylorus and preserving the right gastric and epiploic vessels. The high vasa brevia from the spleen to the cardia still may be somewhat hard to get at, but by careful traction of the stomach, combined if necessary with a 20 to 30 degree tilt of the table to the right, they can be divided piecemeal between ligatures without the risk of using clamps, which may cause tearing of the mesentery or the spleen.

The esophageal hiatus can be [illegible] from above and below, and the [illegible] be carefully eased up into the [illegible] traction on the esophagus from [illegible] gentle upward pushing of [illegible] below. If the stomach [illegible] enough, the esophag[illegible] the cardia, the card[illegible] closed and the [illegible] brought up in front of the liver and [illegible]. Mobilization of the duodenum [illegible] give still further length if required.

The chest is next rotated once more into the lateral position, and the esophagogastrostomy anastomosis is done. If the anastomosis is being performed in the neck, the thoracic and abdominal incisions are closed and the chest allowed to rotate back into the supine position. Through an incision along the anterior border of the right sternomastoid [illegible] the medial [illegible] of the right clavicle and the anterior 2 inches (5 cm.) or so of the first rib and costal cartilage are removed. The cervical esophagus is [illegible] the stomach is [illegible] and the anastomosis is completed.

William E. [illegible], M.D.

Anatomic and Technical Considerations in the Treatment of Esophageal Hiatal [illegible]
Madden, J. L. [illegible]
[illegible]

The [illegible]
[illegible]
[illegible]

tendinous than the left, arises from the upper three lumbar vertebrae, ascends and separates into superficial and deep muscle layers. The thin superficial layer forms the right margin of the hiatal ring, and the thick deep muscle layer forms the left margin. In none of 15 fresh cadaver dissections did the left crus of the diaphragm participate in the formation of this ring. The surgical correction of esophageal hiatal hernia is accomplished by suturing only the muscle fibers of the right crus, anterior and posterior to the esophagus. The suturing of a dilated esophageal hiatal ring when its long axis is in a horizontal plane can be accomplished adequately only by placing the sutures in this same horizontal plane, because according to the author, closure in a vertical plane causes tension on the suture line. The term "sliding," though correct by definition, is considered confusing. A sliding hernia as defined is an irreducible hernia in which a portion of the wall of the sac is formed by the protruding viscus. With reference to sliding hernias of the esophageal hiatus, this would be the anterior wall of the stomach. With regard to esophageal hiatal hernias, it is commonly interpreted as meaning that the portion of the herniated viscus, namely, the stomach, slides in and out of the hernial orifice. Variation in the size of esophageal hiatal hernias according to the position of the patient are considered more apparent than real and related to the ease of ingress and egress of the barium within the herniated segment of the stomach. In the author's opinion it is the barium that "slides," and it is the variation in the volume of barium within the easily distensible herniated segment of the stomach that usually accounts for the roentgenographic variation in the size of sliding hernias of the esophageal hiatus. Spontaneous reduction of a sliding hernia of this type has not been observed at operation; contrariwise, reduction of the hernia and maintenance of the reduction may at times be most difficult. The frequency and ease with which unsuspected sliding hernias of the esophageal hiatus are demonstrated on routine roentgenograms after a barium meal, and with the patient in the erect position, further attest to the stationary rather than "sliding" qualities of sliding hernias of the esophageal hiatus. The choice of operative approach, either transabdominal or transthoracic, depends upon the particular conditions observed in each patient and the preference of the surgeon. In general, the transthoracic route is preferred.

A very fine description of the procedure to be employed, with good illustrations, is given. Essentially, entrance into the chest is secured through the eighth intercostal space, an inverted T incision is made over the lower portion of the esophagus after the phrenic nerve has been injected with 1 per cent procaine hydrochloride and the esophagus mobilized. The hernial sac is entered directly or through a separate incision in the diaphragm that permits the surgeon's finger to be inserted from the abdominal side, and anterior sutures of No. 0 silk are inserted. Finally, the posterior angle of the esophageal hiatus is closed by approximating the muscle bundles of the right crus with the same material. The mediastinal pleural incision is not sutured, and the chest wall is closed in the usual fashion, with water seal catheter drainage. A modification of the Allison method, in which the flap formed by the phrenoesophageal ligament and peritoneum proximally is sutured to the pleura rather than the peritoneal or under surface of the diaphragm, is also described.

WARREN A. YEMM, M.D.

Carcinoma of the Stomach: Need for Earlier Diagnosis and More Adequate Therapy. Ochsner, A., and Blalock, J., Florida M. A. 42:99, 1955.

This is a detailed statistical review of carcinoma of the stomach as encountered and treated at the Ochsner Clinic, with a comprehensive survey of recent literature for comparison. The incidence of gastric cancer is apparently lower in the South than in the North, except among Negroes. In New Orleans in 1947 the number of cases of gastric cancer per 100,000 of population was 23.5 among white persons and 36.6 among Negroes. In the Ochsner Clinic the incidence of gastric malignant lesions among all patients was 1 in every 555, and 1 in every 588 had gastric carcinoma. Exploration was carried out in 80.3 per cent of the cases and gastric resection in 37 per cent; 32.4 per cent of the patients survived the resection, and 7.2 per cent were alive at the end of five years. These results are not satisfactory, but when one recalls that there was an average delay of eight and four-tenths months from the onset of symptoms until definitive therapy was instituted, it is evident why the results are bad. The fact that a five-year survival rate of 57 per cent was obtained in those cases in which radical subtotal resection was performed and in which the lesion was limited to the stomach demonstrates that if the diagnosis can be made while the lesion is still limited to the stomach, the results will be good. We are convinced from our experience that, although obviously it is necessary to perform a good cancer operation (which consists of radical removal of all the tumor-bearing area of the stomach, with *en bloc* excision of the sites of metastasis), as much can be accomplished in most cases by radical subtotal gastrectomy as by total gastrectomy. The former procedure is certainly to be preferred if the curability incidence is as high as with total gastrectomy, because maintenance of a small gastric pouch, which is accomplished by radical subtotal gastrectomy, greatly minimizes the digestive disturbances that follow total gastrectomy. For some time the authors have been convinced that a good operation for malignant lesions of the stomach can be accomplished in lesions of the distal half of the organ if all of the stomach except a very small portion of the greater curvature is removed, together with the adjacent gastrohepatic, gastro-colic and greater omentums, the first portion of the duodenum, the spleen and all of the regional lymph nodes. The lymph nodes that should be carefully removed are those around the celiac axis, the left gastric vessels, the gastrolienal ligament and the esophagus, plus those in the subpyloric and subhepatic areas. It is important that the first portion of the duodenum should be removed, because of possible infiltration by carcinoma of the duodenal wall of the distal part of the stomach. For lesions located in the proximal half of the stomach, however, and probably for all diffusely infiltrating lesions (linitis plastica), total gastrectomy is necessary, although in these cases this procedure does not give good results. Gastric polyps are definitely premalignant and should always be removed. Lesions in certain cases of gastritis are definitely premalignant, and persons who have pernicious anemia are known to have a higher incidence of gastric cancer than do those not so afflicted. The tumor is usually in the fundus or body, and in the authors' opinion the gastritis is definitely precancerous. They maintain that frozen section at the time of operation has little value, because of the possibility of missing the carcinoma. But that gastric ulcers are precancerous lesions and that a benign ulcer can undergo malignant changes. Men past the age of 40 with minimal but persistent gastric symptoms that do not respond to therapy resulting in loss of weight of 10 pounds (4.5 Kg.) or more within four to eight weeks, with no roentgen evidence of a gastric lesion, and no abnormality on gastroscopic studies or studies of gastric acidity, should be given the advantage of abdominal exploration to determine the presence or absence of a malignant lesion in the stomach.

WARREN A. YEMM, M.D.

Les varices symptomatigues de malformations vasculaires: Essai de classification (Varicose Veins, Symptomatic of Vascular Malformations: An Essay on Their Classification). Cl. Olivier, C., Presse Méd., 88:1822, 1955.

Varicose veins associated with congenital abnormalities usually present two principal groups of symptoms: (a) hypertrophic elongation of the lower limbs and (b) pigmented nevi, often of the planus but sometimes of the vascular or hairy type. There exists, therefore, a triad of bony, venous and vasculocutaneous phenomena which, when present in young persons, should indicate a congenital origin.

These congenital anomalies may divide such a varicose syndrome into three groups: (1) varicose veins symptomatic of agenesia of the deep venous trunks, (2) varicose veins due to congenital arteriovenous fistulas, and (3) varicose veins related to angiomatosis.

As to group 1, Leriche was the first to describe the condition in the living patient. In one of the cases reported by the author, the femoral vein of a boy aged 17 was missing, and the venous circulation of the limb was assured solely by a network of dilated superficial veins. The practical importance of differentiating this condition from the infinitely more common ordinary varices is that operative ligation or sclerosing injections do nothing but aggravate the situation. The most logical treatment would be a vein graft or perhaps Cecca's operation.

Group 2 comprises [illegible] in whi[illegible]
a direct communica[illegible]
artery and the vein, [illegible]
of an angi[illegible]
[illegible]

soft tissues than in bone. Their diagnosis is essentially based on the characteristics of the onset and the distribution of the varicosities. The onset is rapid or progressive. Local cutaneous hypertrophy may exist. A subcutaneous venous pulse, a thrill or a murmur is most suggestive, but these are not constant features. Arteriographic study yields valuable information. A high oxygen content in the blood taken from the varicose vein is an important sign. The condition is often progressive and recurrent; the prognosis is poor.

In group 3, the varicose veins may be related to congenital angiomatosis. Indeed, tuberous subcutaneous angiomas may coexist with varicose veins, owing to vascular abnormalities such as agenesia of the deep veins or arteriovenous fistula. Angiomatous superficial varices may also be isolated or associated with deeper local or diffuse angiomas of the arterial type. The different possibilities are studied. When such varicose angiomatosis is complicated by subaponeurotic angiomas, surgical treatment is of no avail.

Excellent angiograms and color photographs enrich this article. There is no bibliography.

S. A. GUEUKDJIAN, M.D.

Considerations in Surgical Treatment for Duodenal Ulcer. Zollinger, R. M., and Williams, R. D., J.A.M.A. 160:367, 1956.

Increased acceptance of gastric surgery is conditional upon increasing success in avoiding the postoperative recurrence of pain, especially the discomfort of the dumping syndrome.

The type of operation used must be determined partly by the preoperative nutritional status of the patient. The lean type who can hardly maintain adequate nutrition even in good health cannot tolerate wide resection of the stomach. The type of anastomosis used in the Billroth 1 operation leads to better absorption of fat and protein than does that employed in Billroth 2.

The success of the operation is partly determined by the location and size of the stoma. Too extensive a resection leaves the patient with insufficient gastric capacity. Resection of 50 per cent of the stomach, with vagotomy and a Billroth 1 type of anastomosis (end-to-end gastroduodenostomy) is recommended on the basis of 194 operations of this type.

Reoperation is sometimes necessary. It should include vagotomy (if that has not already been done), restoration of continuity between the stomach and the duodenal stump, closure of previous anastomoses and examination of the pancreas for possible adenomas. Attention to the postoperative diet, including semisolid foods rather than liquids during the early postoperative period, hastens the rehabilitation of the patient.

WILLIAM E. NORTH, M.D.

> When the new scientist gets hold of a new scheme by some hook or crook, whether in the laboratory or in his arm-chair at twilight, and proposes to apply it in action, the scheme often has a certain undeniable fascination. It is decked out in a new terminology, which is always dear to the tender-minded . . . But one great and colossal disadvantage it has, which is that no one knows whether it will work or not until it has been tried. And when the tough-minded minority gently suggest this . . . the tender-minded march down on them like an army, terrible with banners, and cry out that the world never progressed by people clinging to old ways. . . .
>
> But the facts are that the tough-minded are the ones who are scientific, that the sun, as a matter of astronomic fact, is stationary in the heavens, and that history might easily be written in terms of people going back to the old ways when a wholesale adoption of new ones had nearly wrecked the structure of society.
>
> *—Clendening*

FOUNDED BY DR. MAX THOREK

The Journal of the International College of Surgeons

Official monthly publication of the International College of Surgeons

Editor-in-Chief
MAX THOREK, M.D., Sc.D., LL.D., F.B.C.S., F.I.C.S., F.P.C.S. (Hon.), F.R.S.M.

Associate Editor
PHILIP THOREK, M.D., F.A.C.S., F.I.C.S.

Consulting Editor
MORRIS FISHBEIN, M.D., F.I.C.S. (Hon.)

Assistant Editors
DOROTHY LANGLEY AND PAULA GOLICK

Specialty Editors

Cardiovascular Surgery
Bert Hollis Cotton, M.D., F.I.C.S., D.A.B.
Los Angeles, California

Genitourinary Surgery
Michael K. O'Heeron, M.D., F.A.C.S., F.I.C.S
Houston, Texas

Neurologic Surgery
James W. Watts, M.D., F.A.C.S., F.I.C.S.
Washington, D. C.

Obstetric and Gynecologic Surgery
J. P. Greenhill, M.D., F.A.C.S., F.I.C.S.
Chicago, Illinois

Occupational Surgery
Chester C. Guy, M.D., F.A.C.S., F.I.C.S.
Chicago, Illinois

Ophthalmologic Surgery
Paul C. Craig, M.D., F.A.C.S., F.I.C.S.
Reading, Pennsylvania

Orthopedic Surgery
Edward L. Compere, M.D., F.A.C.S., F.I.C.S.
Chicago, Illinois

Otolaryngologic Surgery
Francis L. Lederer, M.D., F.A.C.S., F.I.C.S.
Chicago, Illinois

Plastic and Reconstructive Surgery
Neal Owens, M.D., F.A.C.S., F.I.C.S.
New Orleans, Louisiana

Proctologic Surgery
Harry E. Bacon, M.D., F.A.C.S., F.I.C.S.
Philadelphia, Pennsylvania

Surgery of Thyroid, Parathyroids and Thymus
Arnold S. Jackson, M.D., F.A.C.S., F.I.C.S.
Madison, Wisconsin

Thoracic Surgery
Thomas J. Kinsella, F.A.C.S., F.I.C.S.
Minneapolis, Minnesota

Allied Sciences
Dr. Paul Bernard Szanto, F.A.C.P., F.I.C.S., Chicago, Illinois

Official Journal of the International College of Surgeons, Published
PUBLICATION OFFICE: 1516 Lake Shore Drive, Chicago 10,
Entered as second class matter at the post office at Chicago, Ill, under the act
Yearly Subscription: Domestic and Foreign, $12.00

Copyright 1956, by the International College of Surgeons

𝔗𝔥𝔢 𝔍𝔬𝔲𝔯𝔫𝔞𝔩 𝔬𝔣 𝔱𝔥𝔢 𝔍𝔫𝔱𝔢𝔯𝔫𝔞𝔱𝔦𝔬𝔫𝔞𝔩 ℭ𝔬𝔩𝔩𝔢𝔤𝔢 𝔬𝔣 𝔖𝔲𝔯𝔤𝔢𝔬𝔫𝔰

Official monthly publication of the International College of Surgeons

CONTENTS

VOLUME XXV, NUMBER 6
JUNE, 1956

ABDOMINAL AND GENERAL SURGERY

Air Embolism 675
Hamilton Bailey, F.R.C.S. (Eng.), F.R.C.S. (Edin.), F.A.C.S., F.I.C.S., London, England

Tuberculous Peritonitis in a Moribund Patient; Plication; Recovery 689
Thomas B. Noble, M.D., F.I.C.S., Indianapolis, Indiana

Duodenal Ulcer: End Results in Vagotomized Patients 698
Benjamin Goldman, B.Sc., M.D., F.A.C.S., F.I.C.S., and James L. Schuster, M.D., Erie, Pennsylvania

Recent Ideas in Gastric Surgery 713
T. H. Somervell, O.B.E., M.A., M.D, B.Ch., F.R.C.S., F.I.C.S., Vellore, South India

Management of Leg Ulcers 718
Domingo Lucca R., M.S.V.C., Caracas, Venezuela

PVP-Iodine: History, Toxicity and Therapeutic Uses 727
Herman A. Shelanski, Ph.D.,† and Morris V. Shelanski, M.D., C.M. Philadelphia, Pennsylvania

GENITOURINARY SURGERY

Pathogenesis and Treatment of the Idiopathic or Primary Hydronephroses 735
A. A. MacKelvie, M.D., F.R.C.S. (Eng.), F.I.C.S., Alloa, Scotland

Renal Responses to Remote Surgical Manipulation in the Dog 744
Sydney M. Friedman, M.D., Ph.D., Rowland W. Radcliffe, M.Sc., M.D., J. E. H. Turpin,† and Constance L. Friedman, Ph.D., Vancouver, British Columbia, Canada

Complications of Surgery of the Urinary Tract 748
Park Niceley, M.D., F.A.C.S., F.I.C.S., Knoxville, Tennessee

NEUROLOGIC SURGERY

Lesions of the Central Nervous System Masquerading as General Surgical Lesions 751
H. Lester Reed, M.D., F.I.C.S., Louisville, Kentucky

OBSTETRIC AND GYNECOLOGIC SURGERY

Complications of Pelvic Surgery: Hemorrhage 755
Zeph J. R. Hollenbeck, M.D., F.A.C.S., Columbus, Ohio

---

†Deceased

FOUNDED BY DR. MAX THOREK

The Journal of the
International College of Surgeons

FOUNDED IN GENEVA, SWITZERLAND, 1935 - INCORPORATED IN WASHINGTON, D. C., 1940

Vol. XXV JUNE, 1956 No. 6

Abdominal and General Surgery

Air Embolism

HAMILTON BAILEY, F.R.C.S. (Eng.), F.R.C.S. (Edin.), F.A.C.S., F.I.C.S.*
LONDON, ENGLAND

IT is of paramount importance to know that there are two varieties of air embolism—venous and arterial—the clinical manifestations of which are dissimilar. To this *prima facie,* all-sufficient classification must be added paradoxical air embolism, a venous air embolism that becomes arterial by travelling from the right to the left ventricle through a patent foramen ovale. It is true that in 5 to 8 per cent of adults this foramen is patent, but in the great majority the opening is no larger than the bulbous end of a standard probe, and in only 0.5 per cent of these does the valvula foraminis ovalis fail to cover the opening. Consequently, the chances of encountering a case of paradoxical air embolism are small indeed.

This cannot be said of air embolism in general. To review the literature on this subject is to be astonished at the number of cases reported, many in journals devoted to specialized subjects. Even so, one must reflect that the disaster occurs more frequently than the reported cases would seem to indicate. Furthermore, in cases of fatal air embolism in which the true diagnosis is unsuspected, death is often attributed to pulmonary embolus, coronary thrombosis or heart failure. Even at necropsy many emboli are missed because of slovenly technic (Keith Simpson). A not uncommon postmortem obser
slightly blood-stained froth
mouth and nostrils. To simplif
tem diagnosis, J. D. Taylor ha
mended roen
and tru

---

*Emeritus Surgeon, Royal Northern Hospital, London. Submitted for publication March 20, 1955.

cropsy is undertaken. Death from venous air embolism is characterized by primary respiratory failure due to obstruction at the mouth of the pulmonary artery (Oppenheimer and others).

VENOUS AIR EMBOLISM

In a healthy person, approximately 100 ml. of air is necessary to cause death by venous air embolism, but much depends upon the speed of injection, the pressure at which it is made, and the posture of the patient during and soon after the injection. Certain reports have been received from German sources which indicate that a considerable quantity of air could be injected intravenously without a fatal issue, provided the victim was kept in the head-low, right-side-uppermost position during the injection and for some time thereafter. If the recipient is in poor health, a much smaller quantity may determine a fatal issue; in many of the necropsies performed by Keith Simpson the total amount of air that caused death cannot have exceeded 10 to 15 ml.

The variety of ways in which air can be sucked or injected into the venous system is truly remarkable:

During the Collection of Blood from a Donor.—A number of fatal and, happily (after correct treatment), not a few nonfatal air embolisms have occurred during the collection of blood, usually by the vacuum bottle method. In most cases cited there has been a positive (instead of a negative) pressure, or at any rate a lack of vacuum *in the collecting* bottle. The manner in which the accident occurs is as follows: The needle having been introduced into a vein, blood does not flow; the patient is asked to open and close the hand. There is still no flow, so the tourniquet is loosened, and air from the bottle passes along the tubing into the vein. In order to detect a loss of vacuum in a blood-collecting bottle, Don Baxter, of Baxter Inc., gives the following instructions: "Shake the bottle. There is an easily noticeable difference in the sound produced when air is present, or absent." To obviate this danger, the Baxter Company is providing special tubing that dimples if a vacuum is present.

During Continuous Intravenous Fluid Therapy.—a. *The reservoir is allowed to run dry.* Unfortunately this is not the almost unheard-of accident that it is sometimes assumed to be. Particularly if it occurs during the night, the empty bottle may have been replaced by a full one before the medical officer arrives on the scene. Unless he is told of the happening, it is unlikely that he will be able to distinguish the symptoms caused by air embolism from those of pulmonary embolism or coronary thrombosis. The only real safeguard against this accident is to employ an interceptor containing a ground-glass float, which, in the event of the container being allowed to run dry, is self-sealing.

b. *There are punctures in the tubing that admit air.* Drugs are often injected into the tubing of an intravenous set rather than directly into a vein.

Whether the puncture remains potentially patent or not depends upon the quality and age of the rubber tubing; polythene and nylon tubing cannot be expected to be self-sealing. When the tubing is cracked or punctured, air is liable to be sucked into the lumen by the gravitating fluid (Fig. 1). If the screw clamp, instead of being on the tubing between the reservoir *and the drip chamber,* is placed 6 inches (15 cm.) above the needle or cannula, this untoward possibility is obviated (Devas).

c. *Martin's pump is employed to accelerate transfusion or infusion.* If the tubing contains even one puncture this is extremely dangerous, for air is sucked in through the puncture (Langmaid and Mushin).

d. *An interceptor with side channel (still widely used) is employed.* This has so often proved a cause of death from air embolism that it should be banned officially. Fig. 2 shows one of several methods by which air is permitted to enter the infusion and transfusion set via this unnecessary side channel.

e. *Infusion or, more usually, transfusion is hastened by attaching the tubing and bulb of a sphygmomanometer (Fig. 3A) or a Higginson syringe to the air inlet.* Unless the person in control of the pump is ready to clip the tubing with a hemostat before the bottle runs dry, a large quantity of air under pressure is liable to enter the vein. The only way of not being taken by surprise at the speed with which the last few ounces are driven from the bottle is to be ready to apply the hemostat to the tubing when the contents of the bottle has reached the low level of 2 inches (5 cm.) from the bottom.

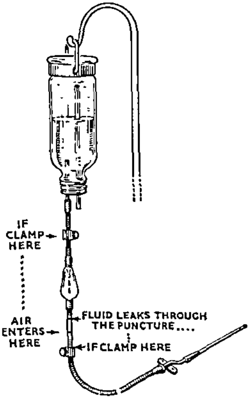


Fig. 1.—Behavior of punctured and cracked tubing in relation to the screw clamp. After Birch. (From Pye's *Surgical Handicraft*, 17th ed., Fig. 28.)

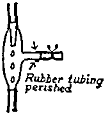


Fig. 2.—Air being sucked in between the glass by-pass and the perished rubber tubing. After Keith Simpson. (From Pye's *Surgical Handicraft*, 17th ed., Fig. 29.)

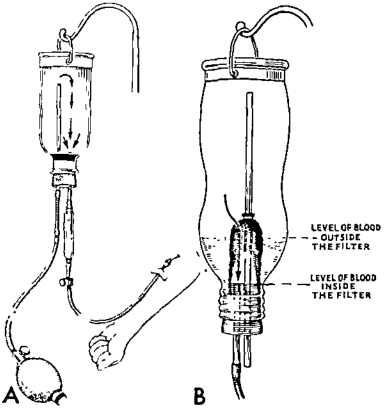

LEVEL OF BLOOD - OUTSIDE THE FILTER
LEVEL OF BLOOD INSIDE THE FILTER
A
B

Fig. 3.—*A*, mode of entry of air when the blood in the bottle is exhausted. *B*, blocking of the filter. Clots on the side of the gauze filter will maintain an apparently safe level of blood in the bottle, while the blood level within the filter falls to zero and permits air to enter the delivery tube. After Mollison.

f. *The filter is blocked.* Another and more subtle cause of air embolism during blood transfusion is a filter covered with blood clot and therefore blocked. The level of blood within the filter can then fall more rapidly than the level of blood outside the filter. In these circumstances it is possible for air to enter the outlet, although the level of blood in the bottle appears to be a safe distance above the outlet (Fig. 4).

This accident is more likely to happen if the same filter is used for more than one bottle of blood. It can occur with either positive pressure or gravitation transfusions.

g. *Attempts ar* [illegible] *introduce a cannula into a* [illegible] ier t [illegible] tourniquet has [illegible]

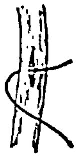


Fig. 4.—Ligature passed through a vein. After tying, air is sucked alongside the cannula. After Keith Simpson. (From Pye's *Surgical Handicraft*, 17th ed., Fig. 30.)

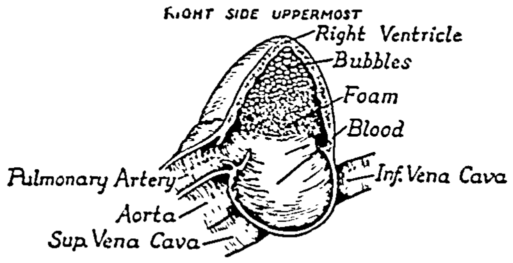


Fig. 5.—Sketch showing how, with the patient on his left side and tilted head downward, air in the right side of the heart rises toward the apex. (From Pye's *Surgical Handicraft*, 17th ed., Fig. 30.)

unforgivable error that is sometimes perpetrated. Air enters while the incision in the vein is being held open to admit the tip of the cannula.

h. *The cannula-retaining ligature is passed through the wall of the vein* (Fig. 5). This occasional technical error is, when the ligature is tied, instrumental in providing a channel for the ingress of air alongside the cannula.

During Induction of an Artificial Pneumothorax.—The occurrence of air embolism during this procedure is a relatively frequent catastrophe, the incidence being approximately 1 in 600 injections (including refills), with a mortality rate not less than 80 per cent. As a rule the air is injected into the intercostal vein (or a radicle thereof) and passes into the azygos system, whence it is carried to the heart and/or, if the patient is in an upright position, air-bubbles rise and, bypassing the innominate vein, enter the superior vena cava and, via the jugular vein, reach the brain. More rarely the air is injected into a tributary of the pulmonary vein, thereby giving rise to an arterial air embolus and often to sudden death. "Pleural shock" is now known to be due to air embolism.

During Thoracoscopic Procedures.—Relatively few cases of air embolism occurring during thoracoscopic studies have been reported.

During Operations on the Lungs, Especially Thoracoplasty. — When a vein encased in fibrous tissue is divided, it is liable to be held open by the adhesions.

During Angiographic Procedures. — In Durant's patient, air entered the ureteric catheter while the syringe containing saline solution was disconnected and before the syringe containing diodrast could be substituted. Stertorous breathing was quickly followed by convulsions, and the patient passed into deep coma. Postural treatment was begun at once, and oxygen was administered. This was the first and only roentgenogram ever taken that showed an air embolism during life. The air was in the more superiorly located (right) pulmonary artery. The patient recovered. In a similar case recorded by Hepper, the patient died.

During Operations on the Heart. — In operations within the open heart the dangerous moment when air embolism may occur is immediately after suture of the myocardial incision and the return of blood flow. Air trapped in the heart is now propelled into the peripheral or the pulmonary circulation. To obviate this ever-present danger, Swan and his coworkers flood the thoracic cavity with Ringer's solution just before closure of the cardiac incision and suture the heart under water.

During Induction of Pneumoperitoneum.—A large number of cases have been reported in which air embolism occurred during this procedure. The most frequent cause is puncture of the liver. Less frequent causes are puncture of the spleen, retroperitoneal emphysema and intravascular injection in the abdominal wall. Twelve deaths from this cause occurred in a few years at the State Hospital of California (Dasher and others); 11 cases were reported from one hospital in Uruguay (Esperanza).

A man aged 34 was admitted to the Royal Northern Hospital with bilateral pulmonary tuberculosis. Both lungs were collapsed by artificial pneumoperitoneum. Two months later the patient returned for a refill. After 600 ml. of air had been injected he complained of discomfort, and his breathing became difficult. The needle was removed; the patient got off the operating table, walked into the passage, collapsed and died. Necropsy showed a puncture of the liver, within which there were large bubbles of air. The right side of the heart was filled with bloody froth.

In an almost identical case reported by Hollander, the patient, a man aged 36, fell dead on assuming the upright position.

During Peritoneoscopic Procedures.—The reported cases are few, which is what one would expect from this little used method of examination.

During Abdominal Operations.—Fortunately the whole field of abdominal surgery is almost immune to the dangers of air embolism, although Rich encountered one during the division of dense abdominal adhesions. No doubt the mechanism of air entry in this case was the same as that observed in thoracoplasty.

During Lavage of a Maxillary Antrum.—Air embolism is a terrifying complication of lavage of the maxillary antrum. Usually it is due not to the lavage itself but to the insufflation of air that sometimes follows. Not only is the latter exceedingly dangerous; it is unnecessary. Pang collected reports of no less than 58 cases in which emboli were due to this cause.

During Excision of the Upper Jaw.—Air embolism is a rare complication of this formidable operation.

During Operations of the Neck.—a. If, in the course of such operations as dissection of tuberculous or malignant cervical lymph nodes, a ligature "blows off" during a fit of coughing (which unfortunately sometimes occurs when endotracheal anesthesia is allowed to become too light), air can be sucked into the jugular vein or one of its tributaries, unless digital pressure, followed by gauze packing, is forthcoming swiftly and dexterously and is maintained until the coughing has ceased.

b. Air embolism is very rare during thyroidectomy. Nevertheless, Guthrie and Evans were able to collect 15 hitherto unreported cases, and there are reports of smaller collected series in the literature. As one can appreciate, the accident occurs oftenest during the removal of a retrosternal goiter.

In Cases of Suicidal Cut-Throat.—The superficial veins of the neck are in many places attached to the deep fascia, and, when they are severed, this attachment prevents their collapse. It is for this reason that air embolism is frequently the cause of death in suicidal cut-throat.

During Radical Mastectomy.—In this instance air has entered the subclavian vein, or one of its tributaries.

Owing to Obstetric or Gynecologic Causes.—a. *Displacement of the placenta:* During or soon after delivery, per via naturalis or by cesarean section, air can enter the open uteroplacental veins if the placenta becomes displaced. In a series of 18 cases collected by Waldrop, all of the embolisms were fatal.

b. *Pervaginal douching during pregnancy:* Scores of air embolisms, most of them fatal, have occurred from douching, usually with a Higginson syringe, with or without intent to induce abortion. Air (as well as soap and water) is forced into the uterus, often by the patient herself. After partial separation of the placenta, the air enters the open veins of the endometrium.

Sur [illegible] *Procedures.*—

A [illegible] have

been

a. *ic*

maneuvers in the presence of urethral hemorrhage. Such accidents occur almost always when the patient is under general anesthesia. I have observed 2 fatal examples at necropsy. In both instances the urethroscopic procedure was carried out with the patient under general anesthesia, and in both the anesthetist felt air bubbles passing along the jugular vein. On the other hand, in many hundreds of urethroscopic studies performed personally without anesthesia, or with a local anesthetic, the accident has not occurred.

b. *Accidents during perirenal insufflation of air, as opposed to oxygen,* to delineate a renal or a suprarenal tumor.

c. *Accidents during aerocystographic procedures.* This is a method that should now be considered obsolete.

During Neurosurgical and Orthopedic Procedures.—The sitting position used for neurosurgical procedures and for the removal of prolapsed intervertebral disc predisposes to air embolism via the paravertebral venous plexus. Hanby and Terry encountered 6 embolisms during operations for excision of prolapsed discs in this position; 5 were fatal.

Clinical Manifestations. — Occasionally the onset is insidious. Much more often it is abrupt, with deep inspirations, coughing expirations, cyanosis, then a few gasping breaths, succeeded by unconsciousness and cessation of respiration. The pulse becomes imperceptible, and the blood pressure falls to an unrecordable level. A stethoscope applied to the precordium reveals the "mill-wheel" murmur—a churning and splashing that masks the true heart sounds. In not a few instances, if the pulps of the fingers are placed over a jugular vein, bubbles of air can be felt moving beneath. In about half the cases, especially those in which the head is higher than the trunk at the time of the entry of air, the state of unconsciousness is preceded by tonic and clonic convulsions followed by muscular twitching. In the presence of venous air embolism the heart continues to beat long after the pulses are imperceptible.

In cases of fatal embolism the symptoms last less than one hour in 86 per cent; between one and twenty-three hours in 7 per cent, and twenty-three hours or more in 7 per cent. In cases of nonfatal embolism the symptoms last less than one hour in 9 per cent of cases, between one and twenty-three hours in 48 per cent and more than twenty-three hours in 43 per cent.

In 20 unreported cases collected by Dasher and his associates, the symptoms were as follows:

Failing pulse (weak or absent)	20
Unconsciousness	19
Cyanosis	18
Apnea	14
Dyspnea	13
Convulsions	10
Restlessness	9
Dilation of pupils	8
Pain in the thorax	6
Incontinence	6

Mechanism.—a. In the right ventricle, blood and air are churned into foam. The bloody foam fills the right auricle, passes on to distend the right ventricle, and causes an air-lock between the latter and the mouth of the pulmonary artery. Whole blood is not compressible; air is. Blood-foam is sufficiently compressible during systole and expansile during diastole to prevent adequate emptying of this chamber of the heart; muscular contractions of the right side of the heart compress the foam, instead of pumping blood into the pulmonary artery. In the presence of massive air embolus some of the bubbles escape into the pulmonary artery, and the arterioles of the lungs become packed with air-locks in which event a fatal issue from cyanosis and anoxia ensues quickly.

b. Large bubbles in veins on the way to the heart rise against the venous blood stream. If the head is higher than the trunk, these bubbles pass up the superior vena cava or, if the patient is coughing and straining, up the paravertebral venous plexus, which serves as a by-passing route. In both instances air bubbles reach the brain.

Treatment. — For a successful result, immediate action and sustained effort are imperative.

1. Tilt the patient so that the head is low. Large bubbles in the venous system then pass to the veins of the pelvis and the lower extremities, there to be absorbed in due course. The head-low position, if adopted rapidly, will prevent cerebral air embolism.

2. Turn the patient onto the left side, i.e., with the right side uppermost. This *must be accomplished within one minute* of the onset of symptoms. Placing the patient on the left side causes air in the right ventricle to rise toward its apex (Fig. 5), permitting whole blood to be pumped by the heart into the pulmonary artery.

3. Perform artificial respiration with the patient on his side. When the catastrophe occurs during an operation with general anesthesia, the anesthetist carries out controlled respirations by administration of pure oxygen under pressure, preferably, of course, via an endotracheal tube. When, as is often the case, an anesthetist is not present, a free airway must be provided by these measures in order of preference: (1) pulling the tongue forward, (2) holding the jaw forward and, when pure oxygen is available, administering it by means of an anesthetic mask, as aforementioned. In other circumstances artificial respiration is carried out with the patient lying on his left side (Fig. 6), which, contrary to what might be thought, is most efficient. It should be noted particularly that, if efforts [illegible] an unobstructed airway fail [illegible] no hesitation in perfo[illegible]

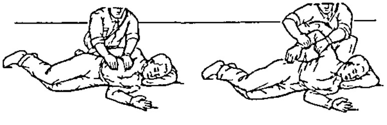


Fig. 6.—Method of carrying out artificial respiration with the patient on his side. *A*, expiration; *B*, inspiration.

This was carried out in Musgrove and McQuigg's patient with striking benefit, and was undoubtedly the turning point toward a successful issue. Even if there is a slight improvement, persevere with postural treatment and artificial respiration. Occasionally the patient must be kept in this position for hours, for when he is turned onto his back there is a recrudescence of symptoms. In one of A. C. Cohen's 4 successful cases recovery followed after eight hours of such treatment.

4. Inject the contents of an ampule of 25 per cent nikethamide (coramine) intravenously.

5. At a very early stage, pass a wide-bore needle in a proximal direction into the usually grossly distended external jugular vein on the right side, and aspirate. Using this expedient, Bohn aspirated blood-stained froth, which brought about rapid improvement. His patient recovered.

6. *If this is unsuccessful, introduce* a lumbar puncture needle, connected with a syringe, into the right ventricle by piercing the skin beneath the left costal margin and directing the needle upward and backward. By this means it may be possible to aspirate the air from the right side of the heart. Stallworth withdrew froth by this route, and the patient recovered.

7. If after two or, at the most, three minutes there are no signs of life, the pa- [illegible] turned [illegible] back and the [illegible] through the [illegible] ntricle can [illegible] and [illegible] fter [illegible] the

blood is returned to the left ventricle. Massage the heart if necessary, *but on no account commence cardiac massage until all the froth has been aspirated.*

ARTERIAL AIR EMBOLISM

In the case of air injected into the arterial tree or the pulmonary vein, the quantity required to produce death is but a fraction of that necessary to produce a similar catastrophe when introduced into the venous system.

Etiologic Factors.—Arterial air embolism may occur (a) when a bottle of blood has been permitted to empty completely during retrograde arterial transfusion; (b) when air is sucked into a pulmonary vein or one of its tributaries during an operation on the thorax, and occasionally (c) when air is injected into one of the tributaries of the pulmonary vein during the induction of a pneumothorax.

Clinical Manifestations: The onset is more catastrophic than is that of venous air embolism. If the patient is conscious, he feels faint or dizzy. Loss of consciousness follows upon these warnings; some patients regain consciousness but are disorientated. Cyanosis is present almost invariably. Convulsions, localized or generalized, tonic or clonic, often occur. Nearly always the pupils become widely dilated. The patient becomes almost or completely pulseless. *The "mill-wheel" murmur is not present.* As a rule there is slowing of the rate of respiration; sometimes breathing is of the Cheyne-Stokes variety. Should the patient be so fortunate as to recover from the acute episode, precordial pain accompanied by considerable dyspnea lasts for hours or, sometimes, days. Various neurologic manifestations, including hemiplegia, monoplegia, nystagmus, strabismus and sometimes blindness, are not infrequent aftermaths.

Pathognomonic Signs: Marbling of the skin of the superior part of the body has often been noted. It is due to embolism of the cutaneous vessels.

Leibermeister's Sign: There is pallor of a portion of the tongue, sometimes half, depending upon which lingual artery or portion thereof is blocked. This sign is said to be constant, but it is often missed because of the anxiety that prevails.

Air Bleeding: If a small incision is made into the skin of the upper part of the body, air bubbles are observed in the blood that escapes. *Bubbles of air* have been observed streaming through the retinal vessels on ophthalmoscopic examination, which is seldom practicable.

Mechanism.—When air enters the left ventricle, three possibilities have to be considered:

1. Air enters and occludes the coronary arteries. This may lead to almost instantaneous death.

2. There is a bolus of air in the left ventricle, which prevents the delivery of blood to and from this chamber.

3. Cerebral air embolism is present. The lumens of the tortuous cerebral arteries are sites *par excellence* for the arrest of itinerant arterial air emboli.

Treatment.—1. Tilt the patient so that the head is low.

2. Turn him onto his left side; it is more advantageous to turn him still further—into the half-prone position—and hold him there. In this position the mouths of the coronary arteries are dependent.

3. Administer pure oxygen, perform artificial respiration.

4. Should these measures fail after two to three minutes' trial, there is only one possible life-saving expedient—expose the heart and aspirate foam from the left ventricle. If there is not sufficient blood to inject after the foam has been discarded, procure more blood by aspirating the right ventricle. Inject the contents of the syringe into the left ventricle and carry out cardiac massage.

Conclusion.—When one is confronted with a case of air embolism, it should be almost a reflex action to place the patient in the head-low, right-side-uppermost position. This is a *sine qua non.* Without a theoretical knowledge of what to do when faced with this emergency, the chances of saving the patient's life are almost negligible.

SUMMARY

The author discusses air embolism in its two forms, venous and arterial, the clinical manifestations of which are dissimilar. Air may enter the venous system (a) during the collection of blood from a donor; (b) during continuous intravenous fluid therapy; (c) through punctures in the tubing; (d) as a result of a blocked filter during blood transfusion; (e) through attempts to hasten transfusion or infusion by attaching the bulb and tubing of a sphygmomanometer or a Higginson syringe to the air inlet; (f) through attempts to introduce a cannula into a poorly-filled vein after removal of the tourniquet (an unforgivable error), and (g) as a result of passing the cannula-retaining ligature through the wall of the vein.

Other surgical procedures and accidents in which venous embolism may occur are artificial pneumothorax (relatively frequent); thoracoscopy (relatively rare); various pulmonary operations; angiography; cardiac operations; artificial pneumoperitoneum; peritoneoscopy; abdominal operations (rare); lavage of a maxillary antrum; excision of the upper jaw; operations on the neck; suicidal cut-throat; radical mastectomy, and various obstetric, gynecologic, urologic, neurosurgical and orthopedic procedures.

The clinical manifestations of venous air embolism include cyanosis, unconsciousness, apnea, dyspnea, convulsions, dilation of the pupils, pain in the thorax, restlessness and incontinence. The treatment, including artificial respiration and, in extreme circumstances, tracheotomy, is outlined in detail. If after two or three minutes there are no signs of life, the patient is turned onto his back, the heart exposed, the right ventricle aspirated, the froth discarded and the blood returned to the left ventricle, with cardiac massage if necessary. *On no account should cardiac massage be commenced until all froth has been aspirated.*

Arterial air embolism is caused by (a) allowing a bottle of blood to empty completely during retrograde arterial transfusion; (b) the sucking of air into a pulmonary vein or tributary during a thoracic operation, and occasionally (c) the injection of air into a pulmonary venous tributary during induction of artificial pneumothorax. The pathognomonic signs are (1) "marbling" of the skin; (2) Leibermeister's sign; (3) air bubbles in the blood stream of the upper part of the body, and, though rarely observed, (4) bubbles of air streaming through the retinal vessels. Treatment consists of positioning the patient in the manner described and administering pure oxygen and artificial respiration.

If these measures fail, the heart should be exposed and the left ventricle aspirated. If there is not sufficient blood to inject after the froth has been discarded, blood should be procured by aspiration of the right ventricle and injected into the left ventricle, after which cardiac massage should be carried out.

RÉSUMÉ

L'auteur discute les deux formes d'embolie gazeuse,—l'embolie veineuse et l'embolie artérielle—dont les manifestations cliniques sont différentes. L'air peut pénétrer dans le système veineux: a) du [illegible] de san[illegible] un donneur; b) [illegible] aveineux; c) l[illegible] d) par

l'utilisation de la pompe de Martin en vue d'accélérer une transfusion ou un goutte-à-goutte; e) par suite du blocage du filtre durant la transfusion sanguine; f) en voulant activer la transfusion ou le goutte-à-goutte, en réunissant le bulbe et la sonde d'un sphygnomanomètre ou d'une seringue de Higginson; g) en essavant d'introduir e une canule dans une veine pauvre en sang après avoir enlevé le tourniquet (erreur impardonnable) ; h) en faisant passer la ligature retenant la canule à travers la paroi veineuse.

Autres techniques et accidents pouvant provoquer l'embolie veineuse: pneumothorax artificiel (relativement fréquent) ; thoracoscopie (relativement rare) ; diverses opérations pulmonaires; angiographie; opérations cardiaques; pneumopéritoine artificiel; péritonéoscopie; opérations abdominales (rare) ; lavage de l'antre maxillaire; excision de la mâchoire supérieure; opérations de la nuque; sectionnement de la gorge (dans les cas de suicide) ; mastectomie radicale; diverses opérations obstétriques, gynécologiques, urologiques, neurochirurgicales et orthopédiques.

Les manifestations cliniques de l'embolie gazeuse veineuse se traduisent comme suit: évanouissement, apnée, dyspnée, convulsions, dilatation pupillaire, douleurs thoraciques, agitation et incontinence.

L'auteur entre dans le détail du traitement, y compris la respiration artificielle et, dans les cas extrêmes, la trachéotomie. Si aucun signe de vie ne se manifeste après deux ou trois minutes, le patient est couché sur le dos, le coeur est mis à nu; on procède à l'aspiration du ventricule droit, à l'élimination de la mousse, et le sang est renvoyé au ventricule gauche, avec massage cardiaque si nécessaire.

Il ne faut en aucun cas pratiquer un massage cardiaque avant d'avoir aspiré toute la mousse.

Les causes de l'embolie gazeuse artérielle sont les suivantes: a) permettre que lors de la transfusion artérielle rétrograde la bouteille de sang se vide complètement; b) aspiration d'air dans une veine pulmonaire ou tributaire durant l'opération thoracique; et (parfois) c) injection d'air dans une veine pulmonaire tributaire durant l'installation d'un pneumothorax artificiel.

Signes pathognomoniques: 1) marbrures de la peau; 2) signe de Liebermeister; 3) bulles d'air dans le flot sanguin de la partie supérieure du corps, et (rarement) 4) bulles d'air le long des vaisseaux rétiniens.

Traitement: placer le malade dans la position décrite et donner de l'oxagène pur; respiration artificielle.

En cas d'échec de ces mesures thérapeutiques, mettre le coeur à nu et procéder à l'aspiration du ventricule gauche. S'il n'y a pas suffisamment de sang à injecter après l'élimination de la mousse, se procurer du sang en aspirant le ventricule droit et l'injecter dans le ventricule gauche; ensuite, massage cardiaque.

ZUSAMMENFASSUNG

Der Verfasser erörtert die Luftembolie. Sie kann in zwei Formen, der venösen und der arteriellen, auftreten, die sich in ihren klinischen Erscheinungen unterscheiden. Luft kann in den venösen Kreislauf gelangen (a) während der Blutentnahme von einem Spender, (b) während einer intravenösen Dauerinfusion von Flüssigkeiten, (c) durch Punktion der Schläuche, (d) durch Verwendung einer Martinschen Pumpe zur Beschleunigung der Transfusion oder Infusion, (e) infolge von Blockierung eines Filters während der Bluttransfusion, (f) durch Versuche, die Transfusion oder Infusion zu beschleunigen, indem man den Ballon und die Schläuche eines Blutdruckapparates oder eine Higginsonsche Spritze an den Lufteinlass anschliesst, (g) durch Versuche,

nach Entfernung der Staubinde eine Kanüle in eine schlecht gefüllte Vene einzuführen (ein unverzeihlicher Irrtum) und (h) infolge von Durchführung der die Kanüle fixierenden Ligatur durch die Venenwand.

Zu sonstigen chirurgischen Eingriffen und Zwischenfällen, die zur venösen Luftembolie führen können, gehören der künstliche Pneumothorax (verhältnismässig häufig), die Thorakoskopie (verhältnismässig selten), verschiedene Lungenoperationen, die Angiographie, Herzoperationen, das künstliche Pneumoperitoneum, die Peritoneoskopie, Bauchoperationen (selten), Spülung der Kieferhöhle, Resektion des Oberkiefers, Operationen am Halse, Halsschnitte beim Selbstmordversuch, radikale Amputationen der Brustdrüse und verschiedene geburtshilfliche, gynäkologische, urologische, neurochirurgische und orthopädische Eingriffe.

Zu den klinischen Erscheinungen der venösen Luftembolie gehören Zyanose, Bewusstlosigkeit, völliger Luftmangel, Atembeschwerden, Krämpfe, Pupillenerweiterung, Schmerzen in der Brust, Ruhelosigkeit und Inkontinenz. Die Behandlung einschliesslich der künstlichen Atmung und, in äusserst schweren Fällen, des Luftröhrenschnittes werden im Einzelnen beschrieben. Wenn nach zwei oder drei Minuten keine Lebenszeichen eintreten, wird der Kranke in Rückenlage gebracht, das Herz blossgelegt, die rechte Herzkammer angesaugt, der Schaum beseitigt und das Blut wieder der linken Herzkammer zugeführt, wenn nötig unter Massage des Herzens.

Herzmassage soll unter keinen Umständen begonnen werden, bevor aller Schaum angesaugt ist.

Die arterielle Luftembolie wird hervorgerufen (a) dadurch, dass man während einer retrogaden arteriellen T[illegible] eine Flasche mit [illegible] lässt, (b) du[illegible] eine Lungenvene oder einen ihrer Äste während einer Thoraxoperation und (c) gelegentlich durch Einspritzung von Luft in den Ast einer Lungenvene bei Anlegung eines künstlichen Pneumothorax. Die charakteristischen Krankheitszeichen bestehen in (1) Marmorierung der Haut, (2) dem Liebermeisterschen Zeichen, (3) dem Auftreten von Luftbläschen im Blutgefasssystem der oberen Körperhälfte und (4) dem selten beobachteten Zirkulieren von Luftbläschen durch die Netzhautgefässe. Die behandlung besteht in Lagerung des Kranken in der angegebenen Weise, in der Verabfolgung reinen Sauerstoffs und in künstlicher Atmung. Wenn diese Massnahmen versagen, wird das Herz freigelegt und die linke Herzkammer angesaugt. Wenn nach der Beseitigung des Schaumes nicht genügend Blut zur Einspritzung übrig bleibt, muss Blut durch Ansaugung aus der rechten Herzkammer gewonnen und in die linke Kammer eingespritzt werden. Danach sollte Massage des Herzens ausgeführt werden.

RIASSUNTO

L'autore tratta l'embolia gassosa nelle sue due forme, la venosa e l'arteriosa, le cui manifestazioni cliniche sono diverse. L'aria per entrare nel sistema venoso a) durante il salasso di un donatore; b) durante l'infusione venosa terapeutica; c) attraverso fori nei tubi; d) per l'impiego di una pompa di Martin per affrettare la trasfusione o l'infusione; e) per un blocco del filtro durante una trasfusione; f) nel tentativo di affrettare una trasfusione o un'infusione mediante una doppia palla inserita sul tubo dell'aria; g) nel tentativo di introdurre una cannula in una vena poco distesa dopo aver tolto il laccio (errore [illegible]) e infine; h) come risultato di [illegible]azione della vena con [illegible]nula.

[illegible] in cui può

aversi embolia gassosa sono il pneumotorace artificiale (abbastanza frequente); la toracoscopia (relativamente di rado); varie operazioni sul polmone; l'angiografia; le operazioni sul cuore; il pneumoperitonea artificiale; la celioscopia; le operazioni sull'addome (raramente); lavaggi del seno mascellare; la resezione dell mascellare; le operazioni sul collo; la mastectomia radicale ed altri interventi di ostetricia, ginecologia, urologia, neurochirurgia ed ortopedia. I sintomi dell'embolia venosa consistono in: cianosi, perdita della coscienza, apnea, dispnea, convulsioni, midriasi, dolore toracico, agitazione incontinenza. La cura, inclusa la respirazione artificiale e, in circostanze estreme, la tracheotomia, viene dettagliatamente esposta. Se, dopo due o tre minuti, il paziente non da segni di vita, occorre esporre il cuore, aspirare il ventricolo destro e far giungere di nuovo il sangue al ventricolo sinistro col massaggio cardiaco. L'aria può entrare nel sistema arterioso: a) lasciando svuotare completamente una bottiglia si sangue nel corso d'una trasfusione intra-arteriosa retrograda; b) per aspirazione d'aria in una vena polmonare, o in una sua tributaria, durante un'operazione sul torace; c) e, accidentalmente, per l'introduzione di gas in una tributaria delle vene polmonari durante l'esecuzione di uno pneumotorace artificiale. I sintomi caratteristici dell'embolia arteriosa sono: 1) la cute "marmorata"; 2) il segno di Leibermeister; 3) bolle d'aria nel torrente sanguigno della parte superiore del corpo; 4) e (per quanto raramente osservate) bolle d'aria nelle arterie retiniche. La cura consiste nel porre il paziente nella posizione descritta, nel somministrare ossigeno puro e nel praticare la respirazione artificiale. Se queste manovre falliranno, occorrerà esporre il cuore ad aspirare il ventricolo sinistro. Se il sangue da iniettare (privato della schiuma) non sarà sufficiente, se ne aspirerà dal ventricolo destro e lo si inietterà nel ventricolo sinistro, poi si praticherà il massaggio del cuore.

SUMARIO

O autor discuitet a embolia aérea em suao duas formas, venosa e arterial, cujas manifestações clínicas são desiguais. O ar pode entrar no sistema venoso (a) durante a transfusão do sangue de um doador; (b) durante a terapia fluida intravenosa contínua; (c) através de punções no tubo; (d) através do uso de uma bomba Martin para acelerar a transfusão ou a infusão; (e) como resultado de um filtro bloqueado durante a transfusão de sangue; (f) através de tentativas para apressar a transfusão ou a infusão; (g) através de tentativas para se introduzir a cânula em uma veia pouco cheia depois da remoção do torniquete (um êrro imperdoável) e (h) como resultado de se passar a ligadura de retenção da cânula através da paredo da veia.

Outros métodos cirúrgicos e acidentes nos quais pode ocorrer a embolia aérea são pneumotórax artificial (relativamente frequente); toracospia (relativamente raro); várias operações pulmonares; angiografia; operações cardíacas; pneumoperitônio artificial; peritonioscopia; operações abdominais (raro); lavagens do antro maxilar; excisão do maxilar superior; operações do pescoço; ferimento do pescoço no suicídio; mastectomia radical, e várias operações obstétricas, ginecológicas, urológicas, neurocirúrgicas e ortopédicas.

As manifestações clínicas da embolia aérea venoso incluem a cianose, inconsciência, apneia, dispneia, convulsões, dilatação das pupilas, dôr no tórax, desassocego, incontinência. O tratamento, incluindo a respiração artificial, e, em circunstâncias extremas, a traqueotomia, é descrito em detalhe. Se depois de dois ou três minutos não houver sinais de vida, o paciente é virado de costas, o coração ex-

posto, o ventrículo direito aspirado, o coágulo é retirado e o sangue devolvido ao ventrículo esquerdo, com messagem cardíaca se necessário.

De maneiro alguma a massagem cardíaca não deve ser iniciada antes de aspirado o coágulo.

A embolia aérea arterial é causada por (a) permitindo-se que um frasço de sangue se esvasie completamente durante a transfusão arterial retrógrada; (b) aspirando-se ar apara dentro de uma veia pulmonar ou tributária durante uma operação torácica, e ocasionalmente (c) a injeção de ar dentro de uma tributária venosa pulmonar durante a realização de pneumotórax artificial. Os sinais pagtonomônicos são (1) enfisema subcutâneo; (2) sinal de Leibermeister; (3) bôlhas de ar na corrente sanguínea da parte exterior do corpo, e embora raramente observado (4) bôlhas de ar através dos vasos retinais. O tratamento consiste em colocar o paciente na posição descrita e administrar oxigênio puro e respiração artificial.

Se essas medidas falharem, o coração deve ser exposto e o ventrículo esquerdo aspirado. Se não houver sangue suficiente para se injetar depois do coágulo ter sido retirado, o sangue deve ser aspirado do ventrículo direito e injetado dentro do ventrículo esquerdo, depois do que deve-se proceder a massagem cardíaca.

BIBLIOGRAFIA

White, P. D.: Heart Disease. New York: The Macmillan Company, 1951. 4th ed.

Postmortem Observations

Annotat. Med. World 71:112, 1951.
Simpson, K.: Lancet 1:697, 1942.
Taylor, J. D.: Brit. M. J. 1:890, 1952.

Air Embolism During Collection of Blood from Donor

Ende, N., and Ziskind, J.: J.A.M.A. 143:1483, 1950.
Kelly, K. M.: M. J. Australia 2:58, 1949.

Air Embolism During Intravenous Fluid Therapy

Bohn, G.: Lancet 1:778, 1942.
Devas, M. B.: Lancet 1:164, 1942.
Doyle, C. B., and Frodsham, P.: Lancet 1:735, 1949.
Langmaid, C., and Mushin, W. W.: Brit. M. J. 2:1142, 1955.
Mackintosh, R. R., and Park, F. A.: Lancet 2:10, 1941.
Wilkinson, C. F. Jr.: J.A.M.A. 146:1318, 1951.

Air Embolism During Induction of Artificial Pneumothorax

Cohen, A. C., and others: Ann. Int. Med. 35:779, 1951.

Larson, L. M., and Nordland, M.: Ann. Surg. 99:112, 1934.

Air Embolism During Radical Mastectomy

Hepler, T. K., and others: Am. J. Clin. Path. 17:322, 1947.

Hewer, C. L., and Coombs, H. I.: Brit. M. J. 1:97, 1948.

Air Embolism from Obstetric and Gynecologic Causes

Cooke, R. T.: Brit. M. J. 1:1241, 1950.

Waldrop, G. S.: Obst. & Gynec. 1:454, 1953.

Waterman, J. A.: Caribbean M. J. 12:487, 1950.

Air Embolism During Urethroscopic Procedures

Trubshaw, K. V.: Brit. M. J. 1:112, 1925.

Ward, R. O.: Proc. Roy. Soc. Med. 16:54, 1922.

Air Embolism During Excision of Prolapsed Disc

Hamby, W. B., and Terry, N. N.: Surgery 31: 212, 1952.

Arterial Air Embolism

Durant, T. W., and others: Am. Heart J. 38:481, 1952.

Geoghegan, T., and Lam, C. R.: Ann. Surg. 138: 351, 1953.

* * *

IMPORTANT NOTICE TO ALL CONGRESS PARTICIPANTS

Those desiring their Congress presentations to appear later as articles in the **Journal of the International College of Surgeons,** please note:

1. **A full copy of the manuscript, together with all illustrations, legends, tabular matter and bibliographic references,** should be sent DIRECT to the Editorial Office, Journal of the International College of Surgeons, 1516 Lake Shore Drive, Chicago 10, Illinois. Manuscripts so submitted will be promptly acknowledged and, on acceptance by the Editorial Board, published as soon after the Congress as possible. **The Journal cannot be held responsible for loss, failure of acknowledgment, delay in publication or nonpublication of any manuscript, or any subsidiary material appertaining thereto, which has not been submitted through the official editorial channels.**

2. Manuscripts may be submitted in advance of the Congress if desired. When this is done, they should be **plainly marked with the name, place and date of the Congress concerned,** to guard against premature publication.

3. Manuscripts delivered in person to Congress officials or others for **press reportorial use only** should be sent by the recipient to the Public Relations Bureau.

These requests are made not only to safeguard the Journal from error but in the best interests of our contributors. To make sure of prompt acknowledgment and efficient handling of your Congress presentation, please send it DIRECT to its ultimate destination!

Tuberculous Peritonitis in a Moribund Patient; Plication; Recovery

THOMAS B. NOBLE, M.D., F.I.C.S.

INDIANAPOLIS, INDIANA

WHEN it is reasonable to assume that there can be no spontaneous cessation of pathologic states whose existence can end only in death, the patient is said to be in a moribund condition.

It has been widely accepted that the fatal factors of peritonitis are three: intestinal obstruction, multiple abscesses, and much loss of peritoneal surface.[1]

In a case of tuberculous peritonitis one is confronted with all the problems associated with all other peritonitis, plus a few more.[2]

The softening that occurs with all types of peritonitis at the areas of localization or abscess formation is observed wherever there are tubercles. This softening of the intestinal wall creates danger in handling the bowel. Tearing of the intestine in resolving intestinal tangles must be avoided; and, with tuberculous peritonitis, this requires more than ordinary care and gentleness.

The fibrinization of the peritoneum is great, general and diffuse where tuberculosis is present. With other forms of infectious peritonitis there may be loops of intestine completely untouched by fibrin; but with tuberculous peritonitis there usually is a dulling of the peritoneal sheath that is universal. The peritoneum is sticky, even where it remains apparently intact.

With tuberculosis, the invasion of the peritoneal surface by fibrin leads to an inevitable and diffuse [illegible] tio[illegible] ee [illegible] surface. *Softening of the subperitoneal* tissues accompanies this change and creates more fibrin. The typical picture of tuberculous peritonitis is that of diffuse fibrinization of affected peritoneal surfaces with extraordinary fragility of the intestinal structure.

The measure of a method of treatment can be taken when the probable prognosis without its use is death. This case history *demonstrates the story of tuberculous* peritonitis, its response to multiple surgical interventions, the obstruction disability from fibrin adhesion, the consequent reactivation of tuberculosis and the continual descent toward death through intestinal obstruction. In this instance, recovery followed therapy properly aimed at all pathologic factors.

REPORT OF CASE

The patient, a man aged 23, arrived at the hospital on Dec. 3, 1955. He was ambulatory but should not have been so. His abdomen was so distended that his clothing could not be fastened. Immediate examination demonstrated the ladder pattern of small bowel distended with gas. Succussion splash was elicited on both sides.

The patient had been continuously ill for two years and had lost 50 pounds (22.7 Kg.).

The temperature was elevated 1 degree, but there was no rigidity of the abdominal wall. The characteristic doughy feeling of peritonitis was present.

He had passed no gas in twenty-four hours; [illegible] ad no bo[illegible] [illegible]vement of any kind, [illegible] s w[illegible] [illegible]ident. He stated [illegible] ay 1953. From [illegible] r there had [illegible] s, *Illinois.*

Submitted for publication

b

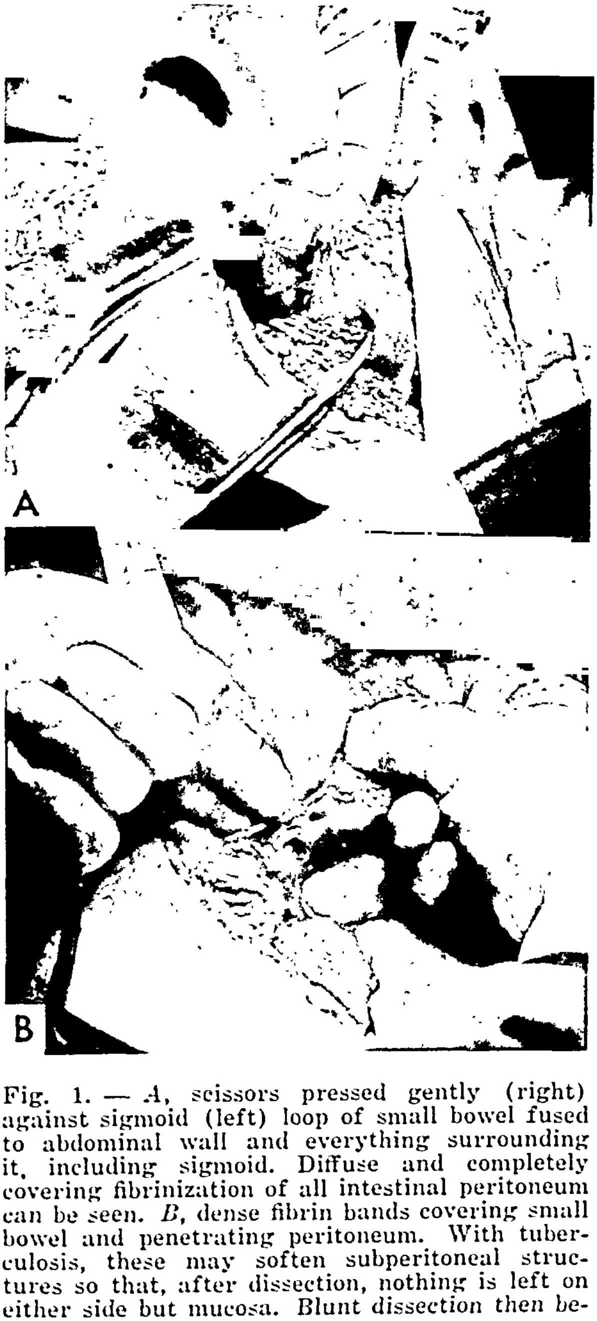


Fig. 1. — *A*, scissors pressed gently (right) against sigmoid (left) loop of small bowel fused to abdominal wall and everything surrounding it, including sigmoid. Diffuse and completely covering fibrinization of all intestinal peritoneum can be seen. *B*, dense fibrin bands covering small bowel and penetrating peritoneum. With tuberculosis, these may soften subperitoneal structures so that, after dissection, nothing is left on either side but mucosa. Blunt dissection then becomes dangerous.

He next entered the Bethesda Naval Hospital, Bethesda, Maryland, on Oct. 15, 1953, and stayed there until March 1954. He then entered the Mount Alto Hospital, Washington, D. C., and remained there from March 28 to April 28, 1954. There two operations were said to have been performed. His trouble had begun with what was presumed to be appendicitis, and obstruction had necessitated further operations, at which the adhesions were recognized.

Next, from June 15 to July 25, 1954, he was in the Evans Hospital, Middleborough, Kentucky. From there, where he remained until August 20, he was referred to the Wayside Hospital, Lexington, Kentucky. The question of the complaints being due to psychosis was raised; shock treatment was given, followed by further therapy along that line.

From Sept. to Oct. 5, 1955, he was in the Piqua Memorial Hospital, Piqua, Ohio. There he underwent another operation for adhesions. He entered the Casualty Hospital, Washington, D. C., on November 20 and remained there until December 2.

He entered the Methodist Hospital, Indianapolis, Indiana, on Dec. 3, 1955, and remained there until December 20. The following operation was performed and the photographs taken on December 5, in Indianapolis.*

The diagnosis of multiple obstructions due to adhesions was easily made. The probability of tuberculous peritonitis entered the picture because of the condition of the abdomen on palpation. Preparatory treatment was undertaken without intubation.

Although intubation extracts fluid, electrolytes, and protein from the patient, it may be vitally essential in any case. With these patients I try to avoid it if possible. In this case it was not essential.

An ampule of pituitrin was given every hour, and a 15 mg. prostigmine tablet was given every four hours. These immediately created violent peristalsis and collapse of the abdomen from liquid stools.

I began this practice thirty-six years ago and have not observed any untoward accident or harm to the patient. I have not encountered aggravation of any coronary disease; I have observed no cerebral accident; there has been no intestinal perforation or worsening of the patient's condition from the use of pituitrin.[3]

Within forty-eight hours the abdomen was flat and empty of gas and water. Then the patient was taken to the operating room, and a midline incision was made through former scars. The photographs illustrate, more effectively than words, the course of the surgical experience and the pathologic states.

---

*On unknown dates during the two years of illness this patient, a naval veteran, said that he was "in the Johnson City, Veterans Hospital, Johnson City, Tennessee, the Louisville Veterans Hospital, Louisville, Kentucky, and the Durham Veterans Hospital, Durham, North Carolina." He had forgotten the dates and durations of these experiences for the treatment of his present complaint.

There was great difficulty in securing entry into the abdomen, because the anterior abdominal wall was intimately fused with the wildest array of intestinal loops.

Although most of the tuberculous peritonitis was represented by abscesses at the root of the mesentery, its presence can be observed in some of the pictures.

Though I have always preferred an approach to the ileocecal junction as early as possible,[2] in such a severely ill patient it cannot be done. The maze of intestinal fusion is such that it has to be transversed by dissection before the ileocecal region can be reached.

It has long been recognized that perforation of the intestine in the presence of tuberculous peritonitis will probably result in fistula through failure of union. Interrupted suturing with nonabsorbable material here spells a threatened disaster. It is not advisable in any plication.[4]

I have learned that, when loss of substance leaves only mucosa after dissection liberation of an intestinal tangle, there need be no fear of fistula or perforation. Plication can be done so that every weak spot is fixed against the sound substance of another loop of intestine. Resection has been avoided; it is almost never necessary when plication is used properly.

For the safe union of edematous small bowel in which necrosis requires resection, I developed what I call "wing-anastomosis" many years ago.[5] Poth modified wing-anastomosis, but his technic places weakness where stress is greatest and so misses the real service so badly needed in these situations. I have observed that the original wing-anastomosis is best when tuberculous peritonitis is present, when there has been loss of a long segment of bowel from necrosis in the presence of disseminated peritonitis, or when a cicatrix necessitates short-circuiting an inflamed bowel.

When peritonitis from any source is present along the full length of the small bowel, it *becomes imperative not to sacrifice, needlessly,* a loop of bowel, and to avoid resection if possible. No bowel was resected in this case, even though much of the small bowel had nothing left but mucosa after dissection liberation.

It is obvious that handling intestine as badly damaged as this will be accompanied by tremendous serous exudation, blood loss, loss of protein, electrolytes, etc. This is anticipated, and replacement therapy was given intravenously at the beginning of the operation, so that at no time was any shock evident.

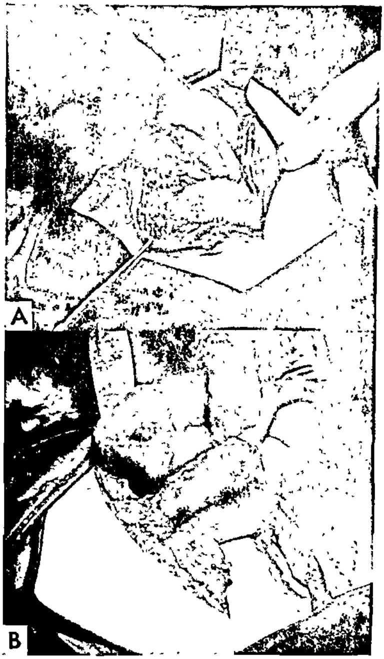


Fig. 2.—*A*, rough, granular remnant of mesenteric abscess at bottom of which this loop was stuck. Great delicacy in handling is most important; therefore, author uses no "lap sponges," which could easily tear through this softened, damaged bowel before it is reached. *B*, photograph, three loops of bowel covered by a fibrin plaque, appearing as one loop. Obstruction-distention of bowel and intense injection of its blood vessels are evident, as is ecchymosis resulting from dissection-liberation.

There is a rule-of-thumb measure that serves here: If the intravenous fluid is flowing in at the desired and proper rate, the intestine becomes wet and more difficult to handle; if the intestine remains dry and sticky and is to handle, th t will suffer shock. a of liberation is the best treatment for tuberculous peritonitis. It used to be said that opening the abdomen for the entry of air was adequate, but time has passed; surgeons now know better. They know that if they can produce a congestive inflammation at the sites of all tuberculous lesions, they can promote recovery. Thus, the trauma of dissection here becomes an important part of treatment of the patient's tuberculosis. Previous operations, no doubt, benefited this condition, but reformation of the intestinal tangle and the increasing intestinal obstructions brought about reactivation of the infection. Peritonitis of all kinds subsides quickly in the absence of obstruction.[6] In the presence of any degree of obstruction, it will continue indefinitely.[7]

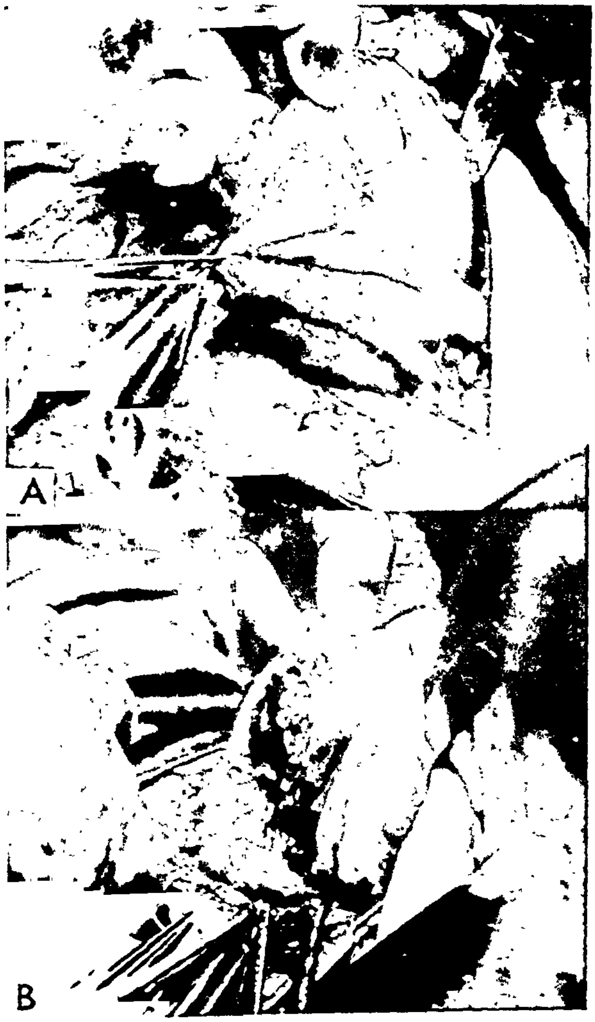


Fig. 3. — *A*, dissection of a loop of small bowel, held by an unfastened Allis clamp. Note line of union between small bowel and sigmoid, held in surgeon's fingers, demonstrating intimate fusion that can be separated only by sharp and dangerous dissection. *B*, small bowel, freed from the sigmoid, as it is partially restored to abdomen down to left. Note thick, rough, corrugated peritoneum.

Continuous plication of all of the small bowel was done from the ileocecal end to the ligament of Treitz. As it has been said elsewhere, we prefer continuous suture and, in this case, the use of absorable material, of course.[8]

Thomeret of Paris[9] has made a worth-while suggestion as to the technic of plication. He has recommended the plication of all the small bowel and does not sew the mesentery. He is convinced that this is needless, and his results are excellent and statistically identical.

Since here the root of the mesentery almost universally[10] showed caseous, tuberculous abscesses almost throughout, and large vessels were very near to the crumbly material that would have had to be sewn if my preferred method had been followed, I chose to plicate the small bowel throughout its length, suturing only along the intestinal mesenteric line, according to Thomeret's contribution.

Some say that a definite opening should be made at each apex of each wing of plication, but I have maintained that in every case the mechanical indication, not the fixed rule,[11] should guide the surgeon.

It is of the greatest importance that the wing of plication next to the cecum be guided right. I have seen some patients in whom plication had been done with the apex of the first wing next to the cecum, heading into the pelvis. This creates a certain degree of partial obstruction at the ileocecal region, and the symptoms continue. I recommend that the wing of ileum next to the cecum be plicated parallel to the cecum, so that the apex of that wing is toward the patient's chin.[12]

Before the operation, pituitrin and prostigmine had been effectively used. These were continued by hypodermic immediately after the operation.[13]

In my opinion, excess gaseous distention after plication might possibly tear loose the intestinal suturing. When tuberculosis is present, consequent rupture of the intestine could be fatal. I have not encountered this calamity and continue the aggressive use of pituitrin as a preventive.

This patient was watched carefully and

continuously. Pituitrin was given every hour. Prostigmine was added every four hours, orally, after the second day.

Levine suction was used for twenty-four hours. I did not favor Miller-Abbott suction, because the plication extended to the ligament of Treitz, and the soft, tuberculous intestine might be damaged by a foreign body.

After the Levine suction was discontinued, the administration of liquids was begun. Active peristalsis could be heard, always accelerated by pituitrin. There was no vomiting.

The patient had been in a number of hospitals and had undergone some seven operations in the past two years. He was watched closely, and it was observed that there was a relation between his complaint and the narcotic relief of symptom.

All narcotic relief was stopped before the first forty-eight hours had passed. It was explained that his pain was tolerable, that pituitrin would aggravate it, but that he was to learn to do without the narcotic crutch. He, too, wished to avoid that evil possibility, and pituitrin hyperperistalsis is always painful.

The traumatic peritonitis was expected to produce ileus and distention if not prevented. Only under pituitrin and prostigmine was peristalsis obtained during the first few days. Although the abdomen showed rigidity and doughiness, it was kept flat at all times, and I was sure that there had been no danger of plication separation due to distention of loops of bowel.[2]

A unique result of the combination of prostigmine and pituitrin was observed. On the seventh day, after bowel movements had begun (the first two bowel movements occurred on the third day), I noted a slowing of the pulse rate to 48. This is the only instance of bradycardia I have observed, although I have used many thousand ampules of pituitrin in the treatment of peritonitis over the past thirty-six years.

Withdrawal of pituitrin and prostigmine for two hours allowed the pulse to return to normal, and pituitrin was continued. The prostigmine was withdrawn and not used again.

On the tenth day the patient was ambulatory and free from pain, and semisolid stools were passed three times a day, the patient following a regular diet. He demolished a basket of fruit without causing undue distention; oranges, bananas, apples, grapes and figs. He was 23 years old, and hungry!

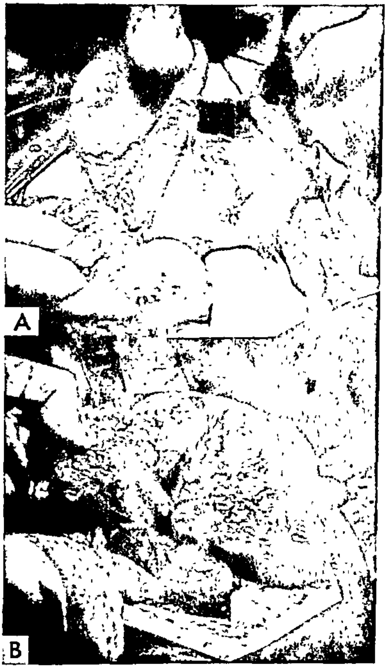


Fig. 4. — *A*, distended small bowel resembling colon. With such distention these loops may be fused to collapsed loops and may be close to or widely separated from other adherent loops, but held together by abscess formation. *B*, dense fibrin destruction of peritoneum with splitting of fibrin, demonstrating obvious danger of fistulous and artificial entry into bowel. To left, bowel is represented only by mucosa.

The prognosis is recovery of a normal physiologic function of his intestinal tract. There was no discovered evidence of pulmonary lesion or other focus of tuberculosis. We expect and hope to hear of continued recovery. The expectation represents the statistical result of thirty-six years, as has been reported.[14]

COMMENT

The photographs show a state of tuberculous p [illegible] lhes mult[illegible]le

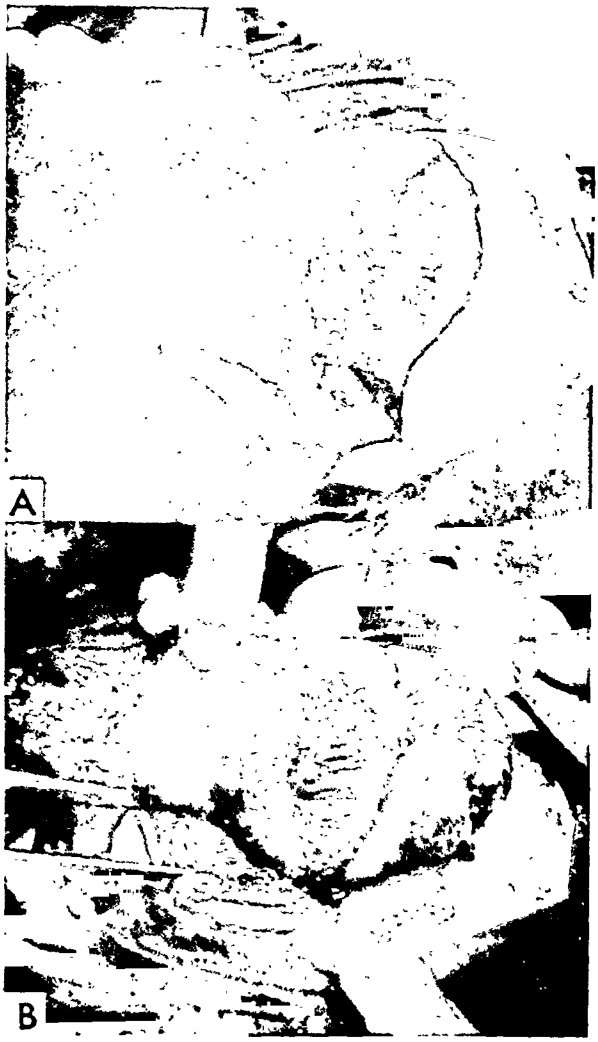


Fig. 5. — *A*, typical picture of fibrin associated with tuberculous peritonitis. As dissection progresses, rough, contracted remnants of adhesions make this resemble a volcanic flow. *B*, wings of plication, some of which are shorter than others owing to condition of mesentery and intestine. Of greatest importance is plication of first wing next to cecum. This wing *must* be plicated parallel to cecum, with its apex toward chin of patient.

obstructions that were classed as hopeless when first seen. The continuous experiences of this patient in many hospitals, including many operations, did not prevent the progress of this complex disease from causing peritonitis and adhesion fixation of the small bowel in multiple obstructions. Plication had not been tried.

I am convinced that the only treatment of such a disease consists of three equally important efforts:

The first, most difficult and most dangerous consists of surgical resolution of the intestinal tangle. (Preoperative preparation is included.) Most of the operative time (80 to 90 per cent) is consumed by dissection. To do this most difficult and dangerous procedure and then stop is actually to increase the same pathologic disorder one is treating.

The second therapeutic step is the only existing prevention of return of the intestinal tangle and the obstructions. Plication of all small bowel is a simple, easy procedure, quickly done.

The third active therapeutic measure is the maintenance of collapsed bowel, hyperperistalsis being obtained by pituitrin until all small bowel has returned to quiet, easy function.

No such thing is known as the prevention of adhesions[15] where such disease exists; therefore, plication to control adhesion and thereby prevent obstruction is now well established.

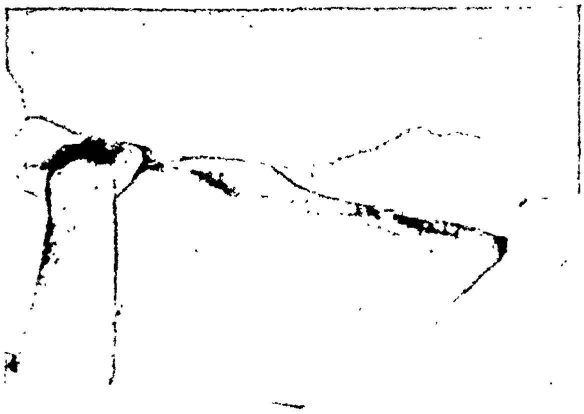


Fig. 6.—Photograph taken tenth day. No protrusion or fixation with lack of respiratory movement is evident. Regular bowel movements follow regular diet, and immediate return of normal intestinal physiologic picture is anticipated, a prognosis supported by adequate evidence.

The unbroken history of illness in the case here reported serves to accentuate the value of the three-pronged attack against this most serious condition. That there is a need for wider use of plication and understanding of its technic and usefulness is obvious.

SUMMARY

The diagnosis was made of tuberculous peritonitis in a moribund patient whose history revealed seven previous operations for release of adhesions and obstructions. No previous attempt at plication was made, so that the pathologic state became worse.

The treatment of tuberculous peritonitis is preoperative preparation, complete resolution of the intestinal tangle, plication of the entire small bowel and postoperative use of pituitrin and prostigmine to maintain a collapsed bowel with hyperperistalsis.

The aforementioned case of extremely advanced tuberculous peritonitis is described. Photographs of the pathologic condition demonstrate the mechanical factor involved, the complex tangle of intestine to be resolved and the fragility of the mesentery and peritoneal structure due to adhesions, abscesses and tubercles; thus the logic of the only successful plan of treatment is demonstrated.

Thomeret's suggestion of plicating the entire small bowel by suturing only along the intestinal mesenteric rim, without suturing the mesentery, is discussed and evaluated.

ZUSAMMENFASSUNG

Im Falle eines moribunden Kranken, dessen Vorgeschichte mehrere Operationen zur Lösung von Verwachsungen und Darmverschlüssen aufwies, wurde die Diagnose einer tuberkulösen Bauchfellentzündung gestellt. Es w[illegible]en vorher keine Einfaltungsversuche gemacht worden, und infolgedessen verschlechterte sich der Krankheitszustand.

Die Behandlung der tuberkulösen Bauchfellentzündung besteht in präoperativer Vorbereitung völliger Lösung der Darmverwachsungen, Einfaltung des gesamten Dünndarms und in Verabreichung von Pituitrin und Prostigmin nach der Operation, um Kollaps und Hyperperistaltik des Darms zu erhalten.

Es liegt eine genaue Beschreibung des oben erwahnten Falles von äusserst vorgeschrittener Bauchfelltuberkulose vor. Photographien stellen die mitspielenden mechanischen Faktoren, die zu beseitigende komplizierte Verschlingung des Darms, die Brüchigkeit des Mesenteriums und des Bauchfells als Folge der Verwachsungen, sowie Abszess—und Tuberkelbildungen dar. Daraus geht die einzig logische Möglichkeit eines aussichtsreichen Behandlungsplanes hervor.

Thomerets Vorschlag den gesamten Düunndarm durch Nähte ausschliesslich am mesenterialen Darmrand einzufalten, ohne das Mesenterium selbst zu nähen, wird erörtert und auf seinen Wert hin untersucht.

RÉSUMÉ

La péritonité tuberculeuse fut diagonisée dans le cas d'un malade moribond, qui avait dejà subit 7 opérations pour le soulagement des obstructions. La condition pathologique était grave. L'auteur présente certains points de vue pré et post opératoire.

Le traitement de la peritonité tuberculeuse consiste d'abord d'une préparation pré-opératoire, de la résolution des intéstins plication (petit intestin), et de l'administration post-opératoire de pétuitrin et de prostignine pour maintenir collapsus [illegible] hyperpéristalt[illegible] de l'intestin.

[illegible] disc[illegible]s de peritonité [illegible] éxtremement

avancé. Des photos de la condition pathologique démontrent la facteur méchanique, la position éxacte des intestins, la fragilité des tructures mésenteriques et peritonéales.

L'autuer discute aussi la méthode la plus logique qui fournit les meilleurs resultats.

Certaines méthodes de plications suggérer par Thomeret sont évaluées.

RIASSUNTO

Venne fatta diagnosi di peritonite tubercolare in un paziente morente, la cui anamnesi aveva dimostrato precedenti interventi per aderenze e occlusioni, ma in cui non era mai stato fatto alcun tentativo di plicatio intestinale cosicchè la condizione si era aggravata.

La cura della peritonite tubercolare consiste nella preparazione preoperatoria, nella completa risoluzione delle torsioni, nella plicatio di tutto il tenue e nell'impiego di pituitrina e prostigmina per mantenere l'intestino vuoto e in attività.

Descritto questo caso di peritonite tubercolare molto grave, ne vengono presentati documenti fotografici che dimostrano l'estensione della lesione, i disturbi meccanici, il completo attorcigliamento dell'intestino, la fragilità dei tessuti conseguente alle aderenze, ai tubercoli e agli ascessi.

Viene, infine, discusso il metodo di Thomeret che consiste nella plicatio di tutto il tenue suturando il margine mesenterico di esso ma senza suturare il mesentere.

REFERENCES

1. Noble, T. B.: Acute Peritonitis: Treatment of the Pathologic Process and Its Immediate Aftermath: Further Experiences with Plication, J. Internat. Coll. Surgeons 14:68-81, 1950.

2. Noble, T. B.: Treatment of Peritonitis and Its Aftermath. Indianapolis: A. V. Grindle, 1945. (233 pages, illustrated.)

3. (a) Zaslow, J.: Early Post-Operative Mechanical Intestinal Obstruction Following Removal of a Gangrenous Ruptured Appendix, Am. J. Surg. 65:276-280, 1944. (Seven cases confirming the basic reasoning behind the use of plication. Keen observation.) (b) Noble, T. B.: The Place of Plication in the Treatment of Peritonitis, J. Internat. Coll. Surgeons 5:313-319, 1942.

4. (a) Smith, R. S.: Plication Operation in Treatment of Small Bowel Obstruction, Northwest Med. 50:10, 1951. (The choice between absorbable and nonabsorbable sutures in plication cannot be agreed upon by all unless this work is read by all. Courageous contribution.) (b) Seabrook, D. B.: Chronic and Recurrent Intestinal Obstruction, West. J. Surg., Obst. & Gynec. 57: 331-335, 1949. (Demonstrates the power of print when seen by the alert and discerning eye—correction of most advanced adhesions by accurate and adequate plication properly applied.) (c) Tesson, J. A.: A Rare Anomaly in Peritonitis Involving the Small Bowel, J. Internat. Coll. Surgeons 17:102-106, 1952. (Cause for speculation: possible role of quadruped position in peritonitis.) (d) Lord, J. W. Jr.; Howes, F. L., and Jolliffe, N.: Surgical Management of Chronic Recurrent Intestinal Obstruction Due to Adhesions, Ann. Surg. 129:315-322, 1949. (Critical analysis of symptoms, causes and results.) (e) Noble, T. B.: Intestinal Suturing and Plication, J. Internat. Coll. Surgeons 22:174-180, 1954.

5. Poth, E. J.: Treatment of Recurring Intestinal Obstruction by the Plication Procedure, Am. Surgeon 19:24-32, 1953. (Diagrams from Noble's "Treatment of Peritonitis and Its Aftermath." Variation of "wing-anastomosis" described, with analysis of results. Satinsky, V. P., and Kron, S. D.: Recurrent Intestinal Obstructions, Mod. Med. April 15:104, 1953. (Describes casually complicaticns that have not been reported elsewhere. ?Curiosa Americana?)

6. Noble, T. B.: Peritonitis, Intestinal Obstruction and Wound Dehiscence, J. Internat. Coll. Surgeons 17:769-780, 1952. Noble.[2] Smith and others.[4b]

7. Noble.[1] Noble.[10]

8. Noble.[6e]

9. Weckesser, E. C.: Plication of Small Intestine for Obstruction Due to Adhesions: Noble Procedure, Arch. Surg. 65:487-497, 1952. (Interesting variation in use of basic principle. Original work.) Noble, T. B.: Perforated Wounds of the Intestine: Satisfactory Method of Treatment for Wounds More Than Twenty-four Hours Old, Am. J. Surg. 62:50-58, 1943. Noble, T. B.: Magnetic Tapes; Six Relevant Titles: Peritonitis, Adhesions, Plication, Accompanying 2x2 Slides; loan basis, Thomas B. Noble, M.D., 19 West 56th Street, Indianapolis, Indiana. Noble.[2]

10. Thomeret, G.: L'Operation de Noble dans Occlusion Intestinale. Les entretiens de Bichat (volume chirgical), pp. 129-132, 1951. Operation de Noble: Nouvelle pratique chirurgicale illustree. Paris: G. Doin et Cie, 1952. Vol. 36, pp. 237-262. Pinson, and Lucciani: Rapport de M. le *Professeur J. Quenu*: Operation de Noble pour occlusion intestinale precoce par peritonite chez un opere de plaies multiplees du grele et de la vessie, Mem. Acad. de Chir. 78:71-75, 1952. Claude, O.: Hypo-

aliemie au cours d'une occlusion intestinale reflexe ayant subie une ileostomie et une operation de Noble, Mem. Acad. de Chir. 78:167-169, 1952. Hepp, J.; Menard, G.; Mercadier, P., and Geigler, A.: Trois cas d'operation de Noble, Mem. Acad. de Chir. 78:171-173, 1952. Noble.[2]

11. Lord, J. W. Jr.: A Critical Evaluation of the Noble Plication Procedure in the Management of Chronic Recurrent Intestinal Obstruction Due to Adhesions. (Fair, friendly and forward-looking, with balanced viewpoint; the true research mind in practical surgery.) Ripstein, C. B.; McDougall, M., and Thompson, H.: The Plication Operation in the Treatment of Peritoneal Adhesions, Canad. M.A.J. 63:43-46, 1950. (Again experimental animal test of principles involved. Carefully done; corroborative.)

12. Noble, T. B.: Plication as Prophylaxis Against Adhesions of the Small Bowel, Am. J. Surg. 25:1, 1937. Plication of the Small Intestine; Second Report, ibid. 45:3, 1939. Noble.[5]

13. Noble.[1] Noble.[2] Zaslow.[3a] Noble.[3b]

14. Noble.[1] Noble.[6]

15. Boys, F.: The Prophylaxis of Peritoneal Adhesions, Surgery 3:118-168, 1942. (The basic classic analysis of all the work done on the prophylaxis of adhesions since 1350 A.D.) Donaldson, and Cameron: A Study of the Use of Silk, Catgut, and the Noble Plication, with Reference to Abdominal Adhesions, Surgery 5:511-521, 1939. (The first attention to test on laboratory animal of the principles involved. Definite.)

ADDITIONAL SOURCES

Bompart, H.: A propos de l'occlusion post-operatoire precoce, Ac. de Chir. 77:525-526, 1951. L'avenir des anastomoses intestinales etablies en periode d'occlusion. Forme chirurgicale un syndrome aprue, Ac. de Chir. 78:419-423, 1951.

Detrie, F.: Le Traitment des Adherences Peritoneales: L'Operation de Noble, Paris Med. 39:283, 1951.

Germain, A.; Thomeret, G., and Bay: Rapport de M. le Professeur J. Quenu: A propos d'un cas d'occlusion par peritonite appendiculaire traite par plicature pertielle de l'intestin grele, Mem. Acad. de Chir. 77:496-504, 1951.

Kuyjer, P. J.: De Operatie Volgens Noble, Tijdschrift voor Geneeskunde 99:19, 1955.

Melbrant, M. J.: Contribution a l'operation de Noble. These, Paris: Foulon, 1952.

Noble, T. B.: Paralytic Ileus from Peritonitis After Appendicitis, Am. J. Surg. 34:419-428, 1952.

Noble, T. B.: Sigmoid Fixation, Am. J. Surg. 22:282-289, 1954.

Poilleux, F., and Germain, A.: A Propos du Process-verbal de l'Operation de Noble, Mem. Acad. de Chir. 77:137-139, 1951.

Poilleux, F., and Frileux, P.: A Propos de l'Operation de Noble, Mem. Acad. de Chir. 77:524-525, 1951.

Quenu, J., and Thomeret, G.: L'Operation Noble (9 cas), Mem. Acad. de Chir. 77:80-86, 1951.

Thalheimer, M., and Malvy, D.: A Propos du Process-verbal: au Sujet de l'operation de Noble dans les Occlusions Intestinales Post-operatoires, Mem. Acad. de Chir. 77:163-163, 1951.

Thomeret, G.: L'operation de Noble. Clinique chirurgicale de Hopital Cochin, Jean Quenu, Professeur: Occlusion Intestinale, extrait. Paris: G. Doin et Cie, 1952. (Here is a 32-page article that goes deeply into all the basic principles as applied to human need, with analysis of results and discussion of possible implications. Reports on 42 patients with major plications for advanced obstructions from all causes. A major contribution to medical writing and medical science. Author can supply photostats to readers unable to find the original article.)

Truchet, P.; Verspyck, R., and Thomeret, G.: Aspect Radiologique Perticulier du Grele apres Plication (Noble), J. de Radiol. 32:9-24, 1951.

Editor's Note: Prof Dr. Joao de Resende Alves, F.I.C.S., of Belo Horizonte, Brazil, whose article *Jejunostomy* appeared in the March issue of the Journal, requests us to announce that it was through an inadvertence that he did not cite the work of Dr. John I. Perl of Chicago (*Surgery* 25: *297-299, February, 1949*; *Gastroenterology*, 13:*322-235, October, 1949*), these articles having come to his attention only after publication of his own. "Reading them now," he writes, "I think it is just to recognize that credit for the original use of valves in jejunostomy belongs to Dr. Perl. His technic is better than the one I have described, because he makes an intussusception of the valve in the direction taken by the intestinal peristalsis, while I only buried the valves—which may be done in the peristaltic direction or not."

Duodenal Ulcer: End Results in Vagotomized Patients

BENJAMIN GOLDMAN, B.Sc., M.D., F.A.C.S., F.I.C.S.,* AND
JAMES L. SCHUSTER, M.D.**
ERIE, PENNSYLVANIA

IN 1943, Dragstedt and Owen[1] reported the first successful vagotomy performed on a human subject. Since then, the many operative series that have been recorded and appraised have led to a prolonged debate on the proper management of duodenal ulcer. The proponents of gastric resection have insisted that it is the proper surgical treatment, and only lately have they been willing to concede that vagotomy is an indicated added procedure. Those who advocate vagotomy and associated drainage operations have been equally firm. From the welter of literature which has been published, it is now clear that the physiologic aims, the surgical indications and the morbidity and mortality associated with all gastric surgical procedures are so well established that there should be no controversy as to the needs of the 15 per cent of patients with duodenal ulcer who eventually require surgical treatment. It is pertinent, however, to review the more important contributions to the literature that have helped to establish the present acceptance of vagotomy in the treatment of duodenal ulcer.

In October 1947, Moses,[2] writing one of the earlier critiques, stated that vagotomy owed its popularity to the immediate and delayed imperfections of gastric resection. These imperfections were postoperative recurrent and marginal ulcers, nutritional impairment, dyspepsia, defective fat absorption, secondary anemia, incomplete relief of pain and subsequent hemorrhages, together with "vagotonic symptoms," the incidence of which was collectively 15 per cent. He was among the first to point out that gastric ulcer should never be treated other than by gastrectomy, especially in patients over the age of 35. He concluded that vagotomy is indicated as a procedure of choice for marginal and duodenal ulcers, especially those penetrating the pancreas or involving the area of the common duct, because these ulcers contribute most to the mortality rate and to technical difficulties. Weinstein and Colp,[3] in the same year, were impressed by the immediate relief of pain following vagotomy. They obtained satisfactory results with vagotomy in the treatment of gastrojejunal ulceration following subtotal gastric resection and were convinced that the psychic and chemical phases of gastric secretion had been reduced or markedly negated.

Meyer, Rosi and Stein,[4] in 1948, reported a series of 35 patients with severe ulcer diathesis in whose cases the indications for surgical intervention were based upon prolonged periods of ulcer symptoms with one or more complications. After vagotomy, all patients had immediate relief of ulcer pain for the first time in many years, and 31 of the 35 were leading unrestricted normal lives. Ulcer management, including dietary and medical treatment, had been completely eliminated. Ruffin and White,[5] discussing the status of vagotomy

---

*Chief of the Department of Surgery, Hamot Hospital, Erie.

**Resident in Orthopedics assigned to General Surgery, Hamot Hospital, Erie.

Submitted for publication Feb. 7, 1956.

in 1948, on the basis of experience with 50 patients, concluded that vagotomy, with either gastroenterostomy or pyloroplasty, was indicated in cases of duodenal ulcer in which there was obstruction, hemorrhage, intractability of the lesion or debilitation of the patient. In the same year, Moore[6] reviewed a group of 116 patients operated on from five to forty-five months prior to the survey. Of these, 99 were operated on for duodenal ulcer, 91 of whom had undergone transthoracic vagal resection with no other procedure. Vagectomy with gastroenterostomy had been performed on 8 patients, in 4 instances transabdominally. Successful outcome (i.e., no recurrence) occurred in 103 patients, approximately 89 per cent of the series. About the same time, Collins, Crile and Davis[7] reported the cases of 240 patients who had been subjected to bilateral vagotomy at the Cleveland Clinic Hospital. There were 5 failures, which were ascribed to the probability that the vagotomies were incomplete.

Early in 1949, Aaron, Lipp and Milch,[8] in a review of the newer aspects of peptic ulcer, discussed vagotomy in general and the report of the committee on ulcer in particular. In their opinion, the immediate relief of ulcer pain by vagotomy was spectacular and indicated that if the procedure is to be done it seems reasonable to employ it in conjunction with some sort of drainage operation. While they admitted that the advantage of the combined procedure over gastric resection remained to be proved, they stated that vagotomy has a special value in the treatment of marginal ulcers and recommended that it should be tried in such cases, because of the technical difficulties inherent in the direct surgical attack on these lesions. Crile, Jones and Davis,[9] in the midyear of 1949, reported a series of 174 cases of intractable duodenal ulcer. They observed that the postoperative courses of the patients who had undergone vagotomy and pyloroplasty or gastroenterostomy was little different from those of patients on whom gastric resection or gastroenterostomy alone had been performed. The striking difference between the two groups was the control of pain, and, although ulcer-like distress often persisted after gastric resection or after gastroenterostomy alone, it was rarely observed after vagotomy. They reported that, after experience in the technic had been gained by operations on a number of jejunal ulcers, they decided to employ vagotomy in the treatment of all duodenal ulcers, and no further gastric resections were performed. Neither were vagotomies employed in the treatment of duodenal ulcer during the period when gastric resections were being done. Therefore, the two series represent a consecutive rather than a selective group of cases. The mortality rate in the vagotomy series was 1.1 per cent, as compared to 3.4 per cent in patients subjected to gastroenterostomy or gastric resection. The conclusion was that, in the first eighteen months after operation, vagotomy in conjunction with gastroenterostomy or pyloroplasty had given better results than had gastric resection or gastroenterostomy.

Grimson, Rundles, Baylin, Taylor and Linberg[10] discussed their clinical experiences during a four-year period from a study of 104 patients who had intractable, frequently recurring or complicated peptic ulcer for which they were treated by vagotomy alone between June 1944 and February 1948 and followed through June 1948. They concluded that, although vagotomy with gastroenterostomy yielded good results in one-half of the patients, the poor results in the remaining one-half, including retention and other symptoms, indicates that vagotomy alone has not been a satisfactory surgical treatment for duodenal ulcer. They suggest that gastroenterostomy be done in addition to vagotomy in those few instances in which this operation is selected in preference to gastric resection. They noted that the side effects of vagotomy seem to diminish or disappear with the passage of time after the operation.

By January 1950, Collins, Crile and Dempsey[11] were able to report an experience of thirty-nine months with 360 patients at the Cleveland Clinic Hospital who had been subjected to bilateral vagotomy for complicated peptic ulcer. This report appraised the first 100 consecutive patients who had undergone the combined procedure for complicated duodenal ulcer. Of this number, 73 underwent bilateral vagotomy plus gastroenterostomy, and 20, bilateral vagotomy plus pyloroplasty. They had been followed from twelve to twenty-nine months, with an average period of twenty months. The mortality rate was 1 per cent. Patients who were considered to have excellent or satisfactory results followed no diet, took no medicine and had no significant symptoms. The authors cited Renshaw and Beck,[12] who reviewed twenty-five years of experience with conventional procedures (i.e., gastrectomy or gastroenterostomy alone) at the Cleveland Clinic Hospital and commented that the patients treated by vagotomy obtained better results than those treated by conventional operations in the same hospital and followed for a similar length of time. Therefore, when an elective operation is indicated for complicated duodenal ulcer, bilateral vagotomy plus gastroenterostomy or pyloroplasty is their procedure of choice. In a paper devoted to the technic of vagotomy and gastroenterostomy for the treatment of duodenal ulcer, Crile[13] pointed out four significant causes of failure: 1. Patients with minimal signs and symptoms of this disease should not be vagotomized, since their condition is usually functional and the results are bound to be poor. 2. Vagotomy should not be used alone. 3. Duodenal ulcer and gastric ulcer should never be considered together from the standpoint of treatment. To avoid the side effects of vagotomy, such as gastric retention, gastroenterostomy should be employed. The stoma should be placed in the most dependent portion of the denervated stomach; the gastroenterostomy should be posterior and antiperistaltic. 4. The vagotomy must be complete, so that the vulnerable gastroenterostomy will not suffer from recurrent ulceration.

An interesting contribution to the literature is a paper by Healy, Hellman and Sauer,[14] in which the authors compared the relative effectiveness of vagotomy alone in 54 patients with that of gastric resection in 263 patients. It was not long after the publication of this article that there appeared an editorial[15] in *Gastroenterology*, based on the Healy, Hellman and Sauer article[14] and entitled "Pessimistic Report of Vagotomy." The editor observed that the vagotomies were performed transthoracically without a concurrent abdominal operation and granted that this was not an ideal procedure. Shortly thereafter, and in the same journal, the Healy, Hellman and Sauer paper[14] and the editorial "Gastroenterology"[15] were answered by Crile, Hoerr and Collins,[16] who pointed out that there could be no validity in statistics based on such a small series and on an obsolete procedure.

During 1951, Dragstedt and Woodward[17] evaluated the status of vagotomy on the basis of seven years of experience with 620 vagotomies. As a result of their studies, they concluded that complete supradiaphragmatic transabdominal vagotomy combined with gastroenterostomy is relatively safe and should replace subtotal gastrectomy as the initial definitive surgical treatment for duodenal, gastrojejunal and certain esophageal ulcers. They indicated that the complications of vagotomy can be controlled or eliminated by gastroenterostomy and adequate postoperative decompression and that recurrent duodenal or gastrojejunal ulcer is almost invariably due to incomplete vagotomy. They pointed out that the deviation of the alkaline juices of the duodenum away from the anastamosis caused by enterostomy in association with gastroenterostomy for duodenal ulcer is a mistake and can be expected to lead to the development of stomal ulcer in spite of complete vagotomy. This is in accordance with the Mann-Williamson phenomenon. Their data also supported the concept of duodenal ulcer as of psychosomatic or nervous origin. Most important of all, they emphasized the corrosive action of the hyperacid gastric juice on the gastric mucosa. Dragstedt[18] restated the role of gastric secretions in the production of ulcer and went into detail as to the production of ulcers in animals. He demonstrated that removal of the gastric antrum alone does not cure duodenal ulcer. Patients so treated show a high incidence of recurrence of stomal ulcer. While he found it possible in experimental animals to produce hypersecretion of hormonal origin, there was no evidence that hypersecretion of hormonal or antral origin occurs in man. He stated that hypersecretion is the chief abnormality in patients with duodenal ulcer; that it is entirely of nervous origin and may account for 80 per cent of the total acid output of the stomach; it can be abolished by completely dividing the vagus nerves to the stomach. The chief postoperative complication is gastric stasis, which can be prevented by gastroenterostomy.

In reporting their experiences with 600 vagotomies, Stempien, Wilkins and Weinberg[19] expressed the opinion that success in the management of duodenal ulcer depends upon (1) careful selection of patients based on sorting out those who have true organic symptoms from those whose symptoms are psychosomatic; (2) the skill of the surgeon in securing a complete vagotomy; (3) the incorporation of drainage procedures, and (4) postoperative management until gastrointestinal function has been reestablished. In their opinion, this procedure is valuable in cases of intractable ulcer, hemorrhage or obstruction; for patients with a history of multiple perforations, and for anastomotic ulcers as well as for diagnostic exploration. For patients with obstruction, pyloroplasty is their preferred procedure in addition to vagotomy, since pyloroplasty provides an opportunity to expose the ulcer and permit accurate localization. In their opinion pyloroplasty provides a lessened tendency to the dumping syndrome and a reduced frequency of postoperative gastritis or anastomotic ulcer. They emphasized the necessity of thorough postoperative care, including maintenance of normal fluid and electrolyte balance.

Grimson, Rowe and Taylor[20] reported their results with vagotomy during seven years, with special reference to their clinical observations and tests of gastric secretions. There was 1 death in their series of 175 patients. Their experiences indicate that vagotomy and gastroenterostomy can be performed with a lower mortality rate than gastrectomy; that there is a lowered incidence of serious complications and recurrence; that the beneficial effects of vagotomy persist, and that insulin tests from three to seven years after vagotomy reveal no free acid or less free acid than in controlled patients.

Dorton, Webb and Royalty[21] reported on vagotomy performed alone and in combination with drainage procedure, 61 times for the treatment of peptic ulcer. Of the 61 patients, 10 with bleeding duodenal ulcer were treated by vagotomy and pyloroplasty. These were followed up to eighteen months, and there had been no recurrence of bleeding or other symptoms and no mortality up to the time of writing. The authors made a plea for immediate operation (vagotomy and pyloroplasty) on patients of this type as soon as adequate blood substitution can be provided so that the bleeding point can be controlled.

Postoperative roentgen studies by Wilkins[22] indicate that vagotomy alone without gastroenterostomy or pyloroplasty has resulted too frequently in prolonged gastric retention. Often an additional surgical procedure is necessary to establish gastric drainage. Barium leaves the stomach more slowly after pyloroplasty than after gastroenterostomy. This is true particularly in the early weeks after an operation. This slowing of emptying time is usually asymptomatic and in most cases returns to normal within four to six months.

Banzet[23] advocated the use of vagotomy and gastroenterostomy for very difficult ulcers, especially when the infiltration is so far to the right that it involves the gastrohepatic ligament and endangers the common duct.

Stempien and Weinberg,[24] after an experience with duodenal ulcer in 700 patients, stated their conviction that recurrent ulceration following vagotomy is evidence of incomplete vagotomy.

Walters and Chance[25] have continued to use gastroenterostomy with and without vagotomy in those cases in which gastric resection seems to carry an unreasonable risk. They do not favor the so-called exclusion operations in which the pylorus is allowed to remain, even though the mucous membrane is removed, in the course of a gastric resection. It is practically never used by them for large duodenal ulcers, because of the high incidence of gastrojejunal ulcers reported by others when the pylorus is left behind.

Dragstedt[26] pointed out some of the details in connection with vagotomy. He insisted that the vagus section be supradiaphragmatic, because it is easier to obtain and divide all of the fibers of the vagi at that level, whereas at the gastric level it is almost impossible to isolate all fibers which have spread out in front and behind the lesser curvature of the stomach. In his opinion, surgeons who have not secured good results have performed the vagotomy at the subdiaphragmatic level. He emphasized the importance of proper case selection, indicating that gastric ulcers and actively bleeding ulcers should be treated by resection; that vagotomy and gastroenterostomy be reserved for the treatment of duodenal ulcers. He expressed preference for a small posterior gastroenterostomy placed at the most dependent portion of the stomach. Finally, he stated that postoperative management should include gastric intubation and decompression for five days, care being taken that the fluid-electrolyte balance is maintained.

Weinberg,[27] in a study covering 481 cases, stated that his mortality rate in vagotomy and pyloroplasty was less than 0.5 per cent and that this procedure was effective in patients with duodenal ulcer with bleeding, obstruction and repeated perforations. He was impressed by the immediate relief of pain given by vagotomy; by the gain in weight, and by a recurrence rate of less than 5 per cent. He was convinced that recurrence is due to incomplete vagotomy. In the total group of operations performed which are subject to review, with and without drainage procedures, there have been 4 surgical deaths in 800 operations. He expressed the opinion that the effects of vagotomy are lasting, judging from roentgen examinations and insulin tests performed as late as five years after the operation.

As the literature of the past three years is studied, it is evident that there has been an increasing awareness and acceptance of Dragstedt's original hypothesis; namely, that duodenal ulcer is the result of hypersecretion of neurogenic origin. Stempien[23] has maintained that duodenal ulcer is the result of stress. "The rationale of vagotomy has its support in the recognition that the primary disturbance in the ulcer patient is not in his stomach but in his brain." A more practical support for vagotomy is the nonrecurrence of ulcer when this operation is complete. Stempien pointed out that there must be very careful selection of patients. Those who have complications are readily selected for operation; the more difficult problem arises with patients who have so-called intractable ulcer, and only after failure of the most intensive kind of anti-ulcer therapy should these patients be subjected to operation. *He also emphasized the necessity for careful* postoperative management.

Edwards[29] reported that it is now generally agreed that duodenal ulcer is primarily a medical disease and that not *more than 15 to 20 per cent of those treated* will require operation. For the latter group there has been no general agreement on what type of operation will give the best results. In Edwards' opinion, surgical intervention for duodenal ulcer should accomplish a cure of the disease; insure the patient against further ulcer development, and leave a stomach pouch which will enable the patient to remain well nourished and protect him against the dumping syndrome. In his opinion, vagotomy has placed the surgical treatment of duodenal ulcer on a physiologic basis. During the past seven years his 150 patients have been treated by vagotomy and antrectomy (with a no-loop posterior gastrojejunostomy). Results in this group have been superior to those following subtotal resection or vagotomy and gastroenterostomy. Not a single jejunal ulcer has developed during a follow-up period of one to seven years, and 90 per cent of the patients have maintained their normal weight. The incidence of the dumping syndrome has been materially reduced. The only deaths in the [illegible] were d[illegible]o cerebral vascular accidents or coronary disease.

Wilkins, Stempien and Weinberg[30] discussed the management of ulcer patients after vagotomy. They emphasized the use of the nasogastric tube with suction for the first five postoperative days, as well as more frequent small feedings. They agreed that a large proportion of the reported poor results after vagotomy are due to faulty postoperative management.

Jakovljevic and Aleksiac,[31] in a comparative report of gastrectomy and vagotomy in the treatment of peptic ulcers, asserted that vagotomy is in harmony with the neurovegetative pathogenesis of ulcer; *that it leaves the anatomic unity of the* stomach untouched, and that it is technically easier to perform, with the important advantage of the low operative mortality rate. Of 128 patients undergoing *partial gastrectomy in the five-year period* from 1947 to 1952, 110 were followed; 41 per cent had severe symptoms, and 7.2 per cent had died as a consequence of the operation. Thus, the authors stated, "the unpleasant fact is that almost one-half of the patients with resection must be considered as life-long invalids or as lost." They pointed out that, in the critiques favorable to partial gastrectomy, insufficient attention is paid to abdominal pain, anemia, recurrence of ulcer and failure to maintain adequate nutrition. Too much emphasis has been placed upon the progressive lowering of the operative mortality rate, with the inference that gastric resection is a benign procedure. In reviewing 116 patients subjected to vagotomy and gastroenterostomy they noted that 93 per cent obtained an excellent result, while 2.5 per cent had malfunction of an anastomosis and 3.4 per cent had gastritis. The total mortality was 0.8 per cent. Because of the small percentage of unsatisfactory postoper[illegible] resu[illegible] the ab[illegible] [illegible]ive [illegible] an [illegible] mainte[illegible] [illegible] they stated, they consider vagotomy with gastroenterostomy the surgical treatment of choice for chronic callous nonpenetrating duodenal ulcer.

Ransom[32] vagotomized 83 patients with duodenal ulcer. There were no deaths in the series. In his opinion the operation has universal applicability, regardless of the status of the ulcer or the condition of the proximal duodenum; there are no resulting postoperative nutritional disorders; it is a procedure for substandard risks. He opposed the Bancroft exenteration of the antral mucosa and the Finsterer exclusion technics. He concluded that by the judicious use of two procedures—limited gastric resection with vagotomy for suitable patients and gastroenterostomy and vagotomy for patients in whose cases difficulties are anticipated—one may secure a high percentage of satisfactory results with an agreeably low mortality rate.

Perhaps the most impressive recent discussion of the vagotomy problem was presented by Beattie[33] in his analysis of the place of vagotomy in gastrointestinal surgery. He paid tribute to Dragstedt and his co-workers for their vision in recognizing the potentialities of vagus section and for the pioneering effort that has led to the establishment of vagotomy both as a thoroughly practical surgical procedure and as a valuable weapon in attacking the problem of peptic ulceration. Comparing vagotomy and drainage procedures with gastric resection, he pointed out that the relatively small stomach that results from radical resection is totally unable to carry out its physiologic functions adequately, since it can neither hold a sufficient amount of food nor digest it properly. In his opinion gastrectomy is a mutilating procedure and the patient suffers afterward from recurrent gastrointestinal upsets that adversely affect his whole economic life. He estimated that about one-sixth of the apparently successful cures involve poor economic results and that one-third of them are physiologic failures. He maintained that all gastric surgeons of experience will agree that not more than 70 per cent of these patients, dietetically and economically speaking, can lead entirely normal lives afterward. Vagotomy, on the other hand, reduces the dangerous acid secretion just as effectively yet leaves the patient with a relatively intact and physiologic gastrointestinal tract—especially if combined with pylorectomy or pyloroplasty. The experience of others and an eight-year follow-up of his own series convinced Beattie that the duodenal ulcer invariably heals spontaneously and that recurrent ulceration is extremely rare if vagal neurectomy has been complete. He stated that convalescence is shorter and smoother and that for the first time in years the patients are restored to normal digestive life and can eat, drink and smoke with impunity. His patients have shown an average gain in weight of 12.9 pounds (5.8 Kg.) in three months, and most of them return to their own occupations within two months. In a series of 695 patients operated on from 1946 to 1954, vagotomy in his hands has yielded 96 per cent of subjective cures and almost 100 per cent of objective cures. The overall operative mortality rate is under 0.5 per cent. He has not lost a patient in the last 450 cases, and he pointed out that, like so many other valuable surgical advances, vagotomy fell into disrepute through overenthusiasm for a new method and lack of technical experience. Many vagotomies were performed without any associated procedure to limit the effects of the subsequent retention of gastric contents, with correspondingly poor results. He expressed conviction that in many cases the patients were not properly screened to exclude the psychoneurotic types, in whom results are bad after any operation. Vagotomy was also used, he pointed out, in the treatment of chronic gastric ulcer, to which it could not be beneficial. In his opinion, imperfect technic and resulting incomplete vagotomies also produced a harvest of failures. He predicted that the final solution of the duodenal ulcer problem will lie in medical treatment when research has developed suitable drugs to control vagotonia. Since no drug thus far has proved entirely satisfactory, failure of medical treatment will continue to result in chronic ulceration, which at present can be dealt with successfully only by surgical means.

A review of the literature published during the past twelve years seems to indicate that vagotomy with an associated drainage procedure for duodenal ulcer is rapidly becoming the surgical treatment of choice now that the criteria requiring this procedure are better understood. Of more than 100 relevant contributions to the literature that have been studied, the papers here discussed seem best to represent the gradual trend toward acceptance of vagotomy combined with a drainage procedure.

COMMENT

This discussion is concerned with a survey and appraisal of the end results obtained in a series of 36 patients with duodenal ulcer who underwent subdiaphragmatic vagotomy alone or combined with other surgical procedures. While this is admittedly a small amount of material, we are encouraged to report our observations because of the continuing interest in this therapy and because Moore[34] has so aptly suggested that vagotomy "is worth a good, careful second look."

We were definitely not among the first

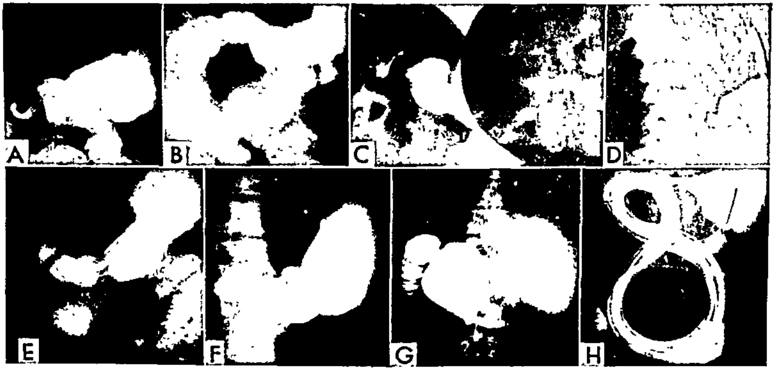


Fig. 1.—*A*, patient F. Z. Film taken Nov. 24, 1948. Note well-defined ulcer crater. *B*, same patient on March 9, 1954, four and one-fourth years after vagotomy and pyloroplasty. Note excellent healing of ulcer and good emptying. *C*, patient F. B. Preoperative film taken Dec. 11, 1953, showing active duodenal ulcer. *D*, same patient on April 6, 1954, five months after vagotomy and gastroenterostomy. Note large stoma and excellent function, plus apparently healed duodenal lesion. *E*, patient R. Y. Preoperative film taken on July 24, 1948, showing -d ed ulcer. *F*, same patient on Aug. 2, 1950, one year after v my alo ote a ınd gas ntes nal dilatation. *G*, same patient on Jan. two -half y e massive dilatation and very slight *H* ient eight loop of Cantor tube, showing oden ti e a.

to embrace this form of treatment, since we wished to hear the results of its early applications. All patients in this series were operated on in the period from Nov. 6, 1948, to March 11, 1954. The oldest patient was 71, the youngest 22. The average age was 45. There were 29 males and 7 female patients, of whom 27 were private patients and 9 were in the charity ward.

We have applied vagotomy only in cases of proved duodenal ulcer that failed to respond favorably to adequate medical therapy. The primary indication for operation in 21 instances was severe, intractable pain. Seven patients complained of both pain and hemorrhage. In 4 cases, hemorrhage alone was the chief complaint. Pain and obstruction were present in 1 patient, and still another presented the triad of pain, hemorrhage and obstruction. Only 2 patients had previous perforations. Both were eventually forced to submit to operation because of continued pain and obstruction.

Since the determination of operability, careful management, and end results are interdependent factors, it must be emphasized that there should be a careful selection of patients for surgical treatment. For instance, 1 death in our series was that of a 60-year-old white man with a long history of attacks of coronary occlusion. This patient was accepted for operation only because of the severity of his duodenal symptoms and the roentgen evidence of posterior erosion. Further, there had been a complete failure of medical treatment. He died during a severe attack of coronary occlusion forty-eight hours after vagotomy and posterior gastroenterostomy. Whether such a patient should be accepted as operable is a debatable point.

The patient himself should be thoroughly briefed by his surgeon, so that the best cooperation may be obtained from him. Most important should be his understanding of the purpose of the nasogastric tube, which we pass late in the day before operation. Preoperative determination of the blood plasma chloride level is one of our routine orders and is repeated frequently after the operation so that chloride replacement may follow as needed.

Our surgical approach to a vagotomy or to a gastric resection is through a long vertical incision extending from the tip of the xyphoid process to 1 inch (2.5 cm.) below and to the left of the umbilicus, but we do not commit ourselves to any operation until the duodenum has been exposed and inspected and the common duct identified. It is at this point that the decision in favor of gastric resection or vagotomy must be made. The presence of a large ulcer too close to the common duct or erosion into the head of the pancreas usually indicates that closure of the duodenal stump will be difficult if gastrectomy is attempted. We are opposed to the Finsterer resection, even with the added removal of the mucosa, on the ground that it compounds an already serious situation. If the duodenal stump cannot be closed safely (and this is true in most cases in which the ulcer involves much tissue), we now consider the operation of choice a thorough vagotomy and a posterior gastroenterostomy. We should like to emphasize three points of technic which, in our opinion, contributes greatly to satisfactory end results. First, the vagotomy is done under direct vision, lighted retractors being used close to the exposed esophagus; second, the gastroenterostomy must be placed in the most dependent portion of the stomach, and finally, if a well placed 3-inch (7.5 cm.) stoma is made (which we consider better than a smaller stoma), the dangers of its contraction and nonfunction are avoided. Our postoperative roentgen studies seem to confirm this position. A factor no less important is obtaining satisfactory end results in the postoperative management. We maintain the tip of the nasogas-

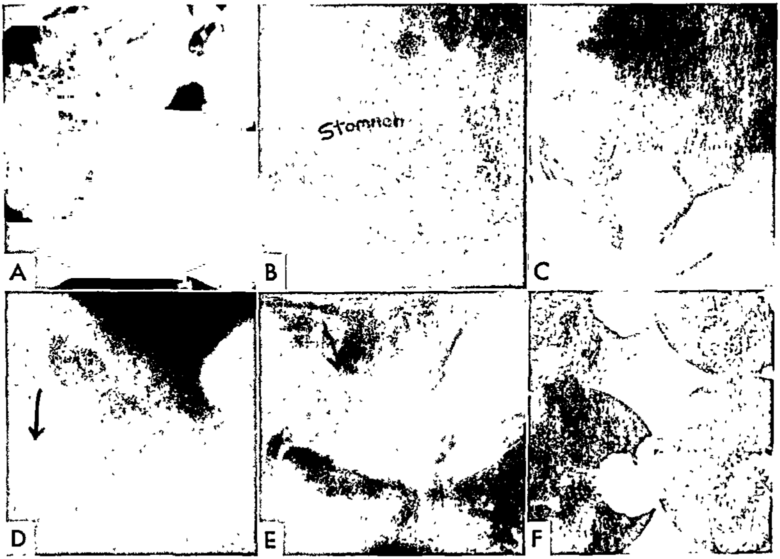


Fig. 2.—*A*, patient B. M. Film taken on Feb. 2, 1954, showing active duodenal ulcer. *B*, same patient on March 22, 1954, eleven days after vagotomy and gastroenterostomy. Note course of barium from first swallow and excellent function of stoma. *C*, same patient on same day, after second swallow of barium. Excellent function of stoma. *D*, patient W. K. Preoperative film taken on April 11, 1949, showing ulcer crater. *E*, same patient on Sept. 30, 1949, more than five months after vagotomy and pyloroplasty. Note almost complete healing of ulcer. *F*, same patient on May 7, 1951, two years after vagotomy and pyloroplasty. Note complete healing of ulcer and good emptying.

tric tube in the stoma until the fifth postoperative day, using suction one hour out of every four or five. For the first twenty-four hours the patient is fed by the intravenous route, but on the second day and for three days thereafter a first-week Sippy diet is used. After the sixth day we use the third-week Sippy diet or a convalescent ulcer diet divided into six feedings (one every three hours) rather than three full meals. We insist that no feeding be larger than 4 ounces, and we ask the patient to continue this diet for at least three months. We observed that none of our living patients had obstruction, abdominal distention or diarrhea when this plan was followed. We are now thoroughly convinced that this type of management is necessary if the best results are to be expected.

The 36 patients of this series underwent 38 operations. Six patients were treated by vagotomy alone, and, of these, 2 returned for further surgical treatment because of gastric atonia and stasis.

The first was a 37-year-old white man whose vagotomy for duodenal ulcer had been performed on Aug. 3, 1949. He was well for about two years, after which he began to suffer from vagotonia and stasis. He was hospitalized in November 1951 for a few days, and at this time suitable doses

Duodenal Ulcer—Vagotomy Series, 1948-1954
Factors that Influence End Results

Preoperative

1. Accurate diagnosis
2. Unsuccessful medical therapy
3. Determination of operability
4. Briefing of patient on objectives
5. Determination of blood plasma level

Operative

1. Adequate exposure
2. Careful exploration of lesion
3. Decision on operation
    a. Gastric resection—*safe* duodenal stump closure?
    b. Vagotomy—under direct vision, plus
    c. Posterior gastroenterostomy — stoma at lowest level of stomach

Postoperative

1. Nasogastric tube suction, 5 days
2. Maintenance of fluid-electrolyte balance
3. Diet
    a. Intravenous first 24 hours
    b. 1st week Sippy 2 to 5 days after the operation
    c. 3d week Sippy thereafter
    d. 6 feedings q 3 h instead of 3 meals
    e. Each feeding not to exceed 4-5 oz. by volume
    f. Duration of diet—about 3 months
    g. No diet restrictions to follow

of urecholine (5-10 mg. three times a day) were administered. This treatment failed, and on December 18 an anterior gastroenterostomy was made because it was not technically feasible to make a posterior opening. Though the patient's recovery from the operation was uneventful, two subsequent roentgen studies indicated that the stoma had failed to function. A Cantor tube even by-passed the gastroenterostomy stoma, forming a figure-of-eight constriction, and obstruction occurred. On Jan. 24, 1952, it was necessary to reopen the abdomen and remove the tube through an incision in the ileum. The patient died the next day.

The second vagotomized patient who required subsequent intervention was a white man aged 59 on Sept. 6, 1948, when he was first operated on. He was symptom-free until January 1953, when he began to have obstructive signs and symptoms. Roentgen examination confirmed the diagnosis of vagotonia and stasis resulting from the stenotic healed ulcer. On May 11 a posterior gastroenterostomy was done, and the patient has been free of complaints to the time of writing.

From our experiences with these 2 patients, and despite the proved fact that vagotomy alone leads to the cure of duodenal ulceration, it is not likely that we shall repeat this procedure without an accompanying posterior gastroenterostomy.

We added pyloroplasty to vagotomy in our next series of 13 cases. One of these cases is of especial interest. The patient was a white man aged 61 on Dec. 1, 1948, when a vagotomy and a Horsley pyloroplasty were done for duodenal ulcer. He made an excellent recovery and was seen a number of times during the next two years. He always insisted that he was symptom-free and happy. In March 1950 it was discovered that he had an infiltrating epithelioma of the bladder, and he was treated by resection of the bladder and prostate in another hospital. At this time a ureteral transplantation was done. He was seen again a few months after this operation and, as usual, reported that he was free of gastric complaints. He died on Feb. 6, 1951, of a local recurrence of the vesical malignant growth, with metastases to the adrenals and liver. In addition to the observations, autopsy revealed "a small shallow ulcer with firm edges lying on the pylorus and measuring 2.5 cm. in diameter. There was appreciable narrowing of the pylorus." Was this a new gastric ulcer? Was the original roentgen diagnosis in error? Was this the result of an incomplete vagotomy? How can we account for the absence of gastric or duodenal symptoms?

In the "follow-up" of our patients who have undergone vagotomy alone or vagotomy and pyloroplasty, there were only occasional complaints of diarrhea or abdominal distention, or both, but these conditions, when present, were always associated with some form of dietary in-

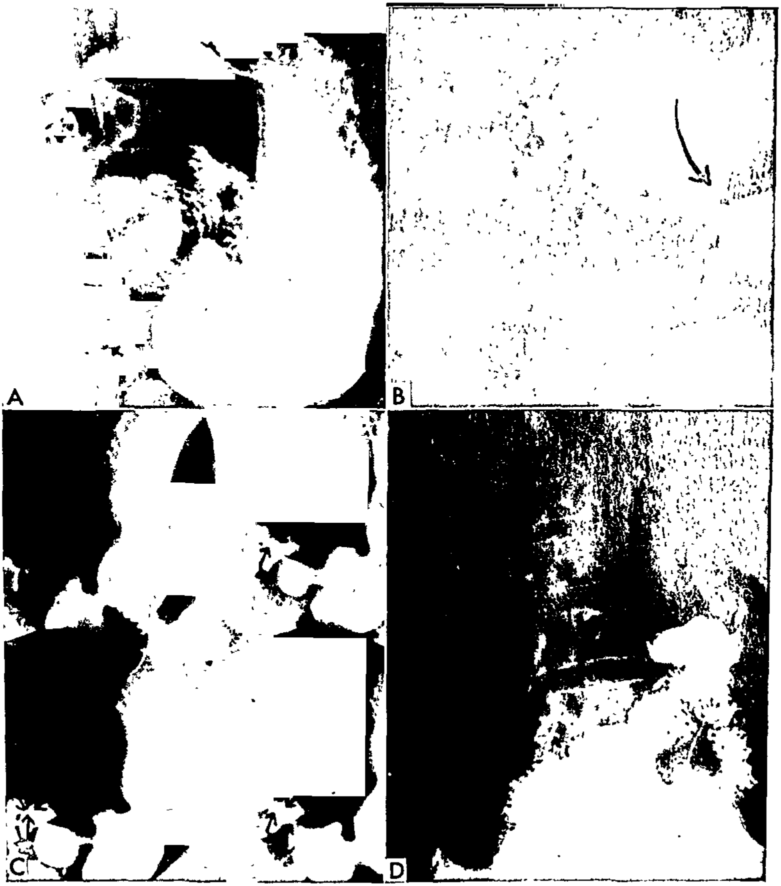


Fig. 3.—*A*, patient W. M. Film taken March 7, 1951, showing large ptotic stomach with active duodenal lesion. *B, same patient on March 18, 1954, three years after vagotomy and gastroenterostomy.* Note again large stoma, excellent function and absence of duodenal lesion. *C*, patient E. G. on Oct. 23, 1952. Serial spot films showing active duodenal ulcer. *D*, same patient on April 6, 1954, eighteen months after vagotomy and posterior gastroenterostomy. Note (a) size and placement of stoma and placement of ulcer.

discretion — alcohol or excessive holiday meals.

Our best results have occurred in the last 17 consecu [illegible] were no complaints of [illegible] rhea or [illegible] omy combined with posterior gastroenterostomy. There have been no recurrent hemorrhages in any of the patients who complained of bleeding preoperatively. In all of the living patients, there has been absolute freedom from duodenal ulcer pain. Not only have all patients maintained their weight, but most of them have gained from 1 to 20 pounds (0.5 to 9.1 Kg.). Except for 2 patients operated on less than three months ago, none follows any form of ulcer diet. Every patient has evaluated his or her operation most favorably. Perhaps the large well-placed stoma eliminates the effects of delayed emptying, which probably occurs in patients treated by other methods. The large inferiorly placed stoma provides for the by-pass of food away from the ulcer, thus giving it an opportunity to heal. Certainly the effects of vagotomy, particularly the reduction of hypersecretion, are equally important to the healing process.

It has been pleasant and stimulating to see these patients one to six years after their operations. While we cannot add great numbers to the evidence already at hand, we have enjoyed taking our "second look" at vagotomy.

From these experiences it would seem logical to contend that the cure of duodenal ulcer must include the return of the patient to his means of livelihood, and the maintenance of his normal state of nutrition and weight, with complete freedom from pain and dietary shackles. Vagotomy and posterior gastroenterostomy, in our opinion, makes this goal possible of attainment.

SUMMARY

A review of the literature of the past twelve years is presented.

The end results obtained in a series of 36 patients with proved duodenal ulcer, subjected to subdiaphragmatic vagotomy alone or vagotomy combined with some other surgical procedure, are appraised.

Patients for this type of therapy should be carefully selected and carefully managed. The best results have been obtained with patients in whose cases vagotomy was combined with posterior gastroenterostomy. On the basis of their postoperative roentgen observations, the authors express the opinion that a large and inferiorly placed stoma contributes to good end results.

ZUSAMMENFASSUNG

Die Verfasser berichten über das einschlägige Schrifttum der letzten zwölf Jahre.

Die an 36 Kranken mit nachgewiesenem Zwölffingerdarmgeschwür, die teils nur mit subdiaphragmatischer Vagotomie, teils mit Vagotomie in Verbindung mit anderen chirurgischen Eingriffen behandelt wurden, erzielten Endergebnisse werden kritisch beurteilt.

Bei der Auswahl und Behandlung von Kranken mit dieser Form der Therapie ist grosse Sorgfalt am Platze. Die besten Ergebnisse werden mit einer Kombination der Vagotomie mit einer hinteren Gastroenterostomie erzielt. Die postoperativen röntgenologischen Nachuntersuchungen führen die Verfasser zu der Annahme, dass eine weite und tief angelegte Anastomose zur Erhaltung guter Enderfolge beiträgt.

RÉSUMÉ

L'auteur présente une revue de la literature des derniers douze ans. Les resultats obténus dans une serie de 36 (cas) d'ulcères du duodenum, curé soit par la vagotomie, soit par une vagotomie en combination avec d'autre types d'opérations, sont discutés.

L'auteur affirme que la vagotomie est indiquée dans certains cas d'ulcères du duodenum, cas cependant quie doivent être

bien choisis. Chaque cas doit être étudié avec prudence, et un éstimé de leurs états, fait.

Les meilleurs résultats furent obtenus dans les cas ou la vagotomie fut combinée avec la gastroéntérostomie postérieure.

L'auteur base son opinion sur ses éxperiences et sur ses faits cliniques (Roentgen), mais il s'accorde que, si une large bouche est placée inférieurement, les resultats obtenus sont éxcellents.

RIASSUNTO

Dopo una rassegna della letteratura degli ultimi 12 anni, vengono presentati i risultati a distanza ottenuti in una serie di 36 malati sottoposti a vagotomia semplice o combinata per ulcera duodenale.

E'necessaria un'accurata selezione prima di sottoporre i malati a questo tipo di intervento. I risultati migliori si ottengono quando si associa alla vagotomia una gastroenterostomia posteriore, sopratutto se quest'ultima è fatta con una bocca ampia e situata in basso.

REFERENCES

1. Dragstedt, L. R., and Owens, F. M. Jr.: Supra-Diaphragmatic Section of the Vagus Nerves in Treatment of Duodenal Ulcer, Proc. Soc. Exp. Biol. & Med. 53:152, 1943.

2. Moses, W. R.: Critique on Vagotomy, New England J. Med. 237:603, 1947.

3. Weinstein, V. A., and Colp, R.: Supradiaphragmatic Vagotomy in Gastrojejunal Ulceration Following Subtotal Gastrectomy for Duodenal Ulcer, Surg. Clin. North America 27:249, 1947.

4. Meyer, K. A.; Rosi, P. A., and Stein, I. F. Jr.: *Studies on Vagotomy in the Treatment of* Peptic Ulcer: II. Clinical Evaluation, Surg., Gynec. & Obst. 86:524, 1948.

5. Ruffin, J. M., and White, D. P.: The Present Status of Vagotomy in the Treatment of Peptic Ulcer, Gastroenterol. 10:607, 1948.

6. Moore, F. D.: Follow-up of Vagotomy in Duodenal Ulcer, Gastroenterol. 11:442, 1948.

7. Collins, E. N.; Crile, G. Jr., and Davis, J. B.: Follow-up of Vagotomy plus Gastroenterostomy or Pyloroplasty for Ulcer, Gastroenterol. 11:453, 1948.

8. Aaron, A. H.; Lipp, W. F., and Milch, E.: Newer Aspects of Peptic Ulcer, J.A.M.A. 139: 514, 1949.

9. Crile, G. Jr.; Jones, T. E., and Davis, J. S.: Surgical Treatment of Duodenal Ulcer—Comparison of Results With and Without Vagotomy, Ann. Surg. 130:31, 1949.

10. Grimson, K. S.; Rundles, R. W.; Baylin, G. J.; Taylor, H. M., and Linberg, E. J.: Vagotomy: Clinical Experiences During Four Years, J.A.M.A. 139:508, 1949.

11. Collins, E. N.; Crile, G. Jr., and Dempsey, W. S.: Medical Follow-up of Vagotomy Plus Gastro-Enterostomy or Pyloroplasty for Peptic Ulcer, Ohio State M. J. 46:33, 1950.

12. Renshaw, R. J. F., and Beck, R. H.: Peptic Ulcer: Evaluation of Surgical Treatment, Proc. Am. Fed. Clin. Research 3:85-86, 1947.

13. Crile, G. Jr.: Technique of Vagotomy and Gastroenterostomy in the Treatment of Duodenal Ulcer, Surg., Gynec. & Obst. 92:309, 1951.

14. Healy, M. J. Jr.; Hellman, S. J., and Sauery, P. K.: Vagotomy Versus Gastric Resection—Comparative Evaluation of Relative Effectiveness in a Controlled Series of Cases, J.A.M.A. 147:368, 1951.

15. Editorial: A Pessimistic Report on Vagotomy, Gastroenterol. 20:348, 1952.

16. Crile, G. Jr.: Hoerr, S. O., and Collins, E. N.: The Vagotomy Problem, Gastroenterol. 21: 591, 1952.

17. Dragstedt, L. R., and Woodward, E. R.: Appraisal of Vagotomy for Peptic Ulcer after Seven Years, J.A.M.A. 145:795, 1951.

18. Dragstedt, L. R.: Gastric Vagotomy in the Treatment of Peptic Ulcer, Post Grad. Med. 10: 482, 1951.

19. Stempien, S. J.; Wilkins, F. B., and Weinberg, J. A.: Selection of Duodenal Ulcer Patients for Vagotomy, J.A.M.A. 149:416, 1952.

20. Grimson, K. S.; Rowe, C. R. Jr., and Raylow, H. M.: Results in Vagotomy During Seven Year Clinical Observations and Tests of Gastric Secretions, Ann. Surg. 135:621, 1952.

21. Dorton, H. E.; Webb, J. G., and Royalty, D. M.: Vagotomy and Pyloroplasty: A Simple *Safe Solution to the Bleeding Ulcer Problem,* J. Kentucky M. A. 50:16, 1952.

22. Wilkins, F. B.: Pyloroplasty for Gastric Drainage with Vagotomy, California Med. 78:513, 1953.

23. Banzet, P.: Vagotomy in the Treatment of Peptic Ulcer, Post-Grad. Med. 13:491, 1953.

24. Stempien, S. J., and Weinberg, J. A.: Recurrence of Ulcer After Vagotomy, J.A.M.A. 152:1593, 1953.

25. Walters, W., and Chance, D. P.: Vagotomy *as a Prophylactic and Curative Procedure in Peptic* Ulcer, J.A.M.A. 153:993, 1953.

26. Dragstedt, L. R.: The Present Status of Vagotomy, Illinois M. J. 106:175, 1954.

27. Weinberg, J.: Vagotomy with Pyloroplasty in the Treatment of Duodenal Ulcer—Surgical Aspects, Am. J. Gastroenterol. 21:296, 1954.

28. Stempien, S. J.: Vagotomy with Pyloroplasty in the Treatment of Peptic Ulcer: Medical Aspects, Am. [illegible] erol. 21:29[illegible]4

29. Edwar[illegible] al Ulc[illegible] *geon 20:907,*

30. Wilkins, F. B.; Stempien, S. J.; Movius, H. J. II, and Weinberg, J. A.: Management of Ulcer Patients after Vagotomy, J.A.M.A. 154:1345, 1954.

31. Jakovljevic, V., and Aleksic, D.: Comparative Report of Partial Gastrectomy and Vagotomy in Treatment of Peptic Ulcer, Arch. Surg. 69:94, 1954.

32. Ranson, H. K.: Evaluation of the Role of Vagotomy in the Treatment of Duodenal Ulcer, Am. Surgeon 20:942, 1954.

33. Beattie, A. D.: The Place of Vagotomy in Gastrointestinal Surgery, J. Internat. Coll. Surgeons 23:139, 1955.

34. Moore, F. D.: Discussion of Rowe et al. Gastric Secretions and Motility after Vagotomy, Surgery 23:240, 1952.

One of the court physicians in the reign of Charles II, invented an instrument to cleanse the stomach, and wrote a pamphlet on it; and ridiculous as a chylopoietic-scrubbing-brush may appear, it afterwards got a place among surgical instruments, and is described as the *Excutea Ventriculi,* or cleanser of the stomach; but the moderns not having *stomach* for it, have transferred it to the wine merchant, who more appropriately applies it to the scouring the interior of bottles. Heister gives a minute description of it, and very gravely enters on the mode and manner of using it; the patient is to drink a draught of warm water, or spirit of wine, that the mucus and foulness of the stomach may be washed off thereby: then, the brush being moistened in some convenient liquor, is to be introduced into the oesophagus, and slowly protruded into the stomach, by twisting around its wire handle. When arrived in the stomach, it is to be drawn up and down, and through the oesophagus, like the sucker in a syringe, till it be at least wholly extracted. Some recommend plentiful drinking during the operation, to be continued till no more foulness is discharged. But though this contrivance is greatly extolled, and said to prolong life to a great age, especially if practiced once a week, month, or fortnight; yet there are very few (probably because tried by very few) instances of its happy effects. More may be seen on this hand, in a controversy published on the subject, between Weddius and Teichmerius, in which this is demonstrated to be no new instrument, having been long described by others.

—*William Wadd,* Circa *1827*

Recent Ideas in Gastric Surgery

T. H. SOMERVELL,* O.B.E., M.A., M.B., B.Ch., F.R.C.S., F.I.C.S.

VELLORE, SOUTH INDIA

"We want a procedure with the minimum anatomical and physiological mutilation consistent with optimum results."

—G. A. Stevens, California

THE many operations that have been devised and are still being devised for duodenal ulcer is in itself a sign that the standard treatment for this condition is unsatisfactory. Many years ago Charles Mayo is reported to have said, "The man who wants to take three-fourths of my stomach out in order to cure a small ulcer will have to run faster than I can," and throughout the experience of a third of a century, in the course of which I have operated in some 6,000 cases of duodenal ulcer, it has remained my conviction that Charles Mayo was right.

For many years the standard surgical treatment was gastrojejunostomy. Then the statistics on stomal ulcer were piled up,[1] and it was obvious that the percentage incidence of stomal ulcer after gastrojejunostomy varied greatly, probably according to the surgeon's skill and the position in which he put his anastomosis. For highly skilled surgeons the figure was around 6 per cent; for the bad ones, 40 per cent.

By 1935, gastrectomy was establishing itself as the standard treatment for duodenal ulcer. Although an old operation, it had been done by few surgeons, most preferring the simpler treatment popularized by men like Moynihan and Walton. Finsterer of Vienna was among those who adopted it as the standard operation for duodenal ulcer. I confess to adopting it myself, especially for my younger patients. I never felt happy about it, however, and when Wilson Hey of Manchester suggested ligation of the gastric vessels I at once began experimenting with various forms of this operation (that is, varying degrees of completeness of ligation), ending up by ligating every gastric vessel[8] "from pylorus to spleen," or very nearly so, as the standard routine.[2] It worked well and cut down acidity in a remarkable way in many cases, and for some years all seemed to go well; but as time went on cases of stomal ulceration began to be recorded, and a recent follow-up of vasoligated patients showed that in 130 cases a "nil result" in 1945 had become an 8 per cent incidence of ulcer in 1950. An important paper by Uvnäs of Sweden[3] explained how this ligation of vessels acts. Uvnäs, by *joining the blood circulation of two* cats and experimenting on the stomach of one of them while observing the stomachs of both, proved that a hormone (Edkins' gastrin of 1906) is secreted by the pyloric antral mucosa and goes into the blood stream.[4] Thence it is carried to the acid-secreting cells in the body of the stomach and produces an acid secretion reaching its maximum about one and a half to two hours after the taking of food. This secretion was produced even in vagotomized cats; *it is therefore hormonal and is carried by the blood stream.* It is this secretion, obviously, that is affected by vasoligation. Although interested that here at last was a [illegible] erimei [illegible]xplanation of the effect [illegible] igati [illegible] sid [illegible] and

---

*Senior Surgeon and Associate Professor, Christian Medical College, Vellore.

Read at a regional meeting of the India Section, International College of Surgeons, Christian Medical College, Vellore, September 1, 1955.

Submitted for publication Dec. 22, 1955.

still consider Uvnäs' experiments fundamentally important, as showing that the secretion of acid in a resting stomach or in response to a nervous stimulus, such as hunger, is to be considered entirely separately from the secretion of acid during the digestive period, which is *not* dependent on the vagi and *is* dependent on the pyloric hormone.

In deciding what operation any individual duodenal ulcer requires, one should therefore know whether there is hyperacidity, and if so, whether this is mainly a rise in the acid content of the fasting juice or of that of the juice secreted during digestion, or of both. Here one encounters two difficulties:

1. Is the fractional test meal a true and valid test? It is the only one available that is easily applied to patients as well as entirely objective, but it does not represent a normal meal. The patient is not in the habit of swallowing a tube and some tasteless gruel for breakfast. To be as reliable as possible, the meal should bear some relation to the patient's normal food and should not be unappetizing; moreover, the Ryle tube must be in the stomach, not passing through the pylorus or an anastomotic opening. Given these two conditions, the test meal is a fairly reliable indication of the acid content of the stomach.

2. Duodenal ulcer often causes some gastritis, which in its turn causes less acid to be secreted. Hence a low acid value for either fasting or digestive gastric juice may be due to gastritis, which after operation will disappear and allow the secretion again to become hyperacid.

With these two factors in mind, the patients can be divided into four main groups:

1. Those with high acid fasting juice, low digestive acidity. In these the vagi are obviously responsible.
2. Those with high acid fasting and high acid digestive-period juice. In these, vagal and hormonal influences are at work.
3. Those with low acid fasting juice, and high acid in digestive-period juice. In these the hormonal influence is paramount.
4. Those with low or normal acidity in both phases. In these it is probable that gastritis has masked the potential acidity of the gastric juice. To evaluate these, gastroscopic study is desirable if a gastroscope is available; if not, a look at the mucosa during operation is a guide.

In the test meal chart, if mucous is recorded as present in all samples of the meal, gastritis is presumably present.

Since the vagus nerve is known to be responsible for the juice secreted in the resting period and in response to psychic stimulation, it follows that high acidity of the fasting juice can be dealt with by vagotomy, of course combined with gastrojejunostomy or some operation that insures an easy outlet for the gastric contents. Since it is also known that the pyloric secretion of hormone produces (through the blood stream) acidity during the digestive period, independent of the presence or absence of the vagi, it follows that for acidity in this phase the best treatment is (a) excision of the pyloric end of the stomach, which produces the hormone; (b) excision of the acid-secreting part of it, or (c) interruption both of the veins that absorb the pyloric secretion and the arteries that bring it to the parietal cells in the body of the stomach. Only experience can decide which of these three methods is best, and it is reasonable to assume that, in this variety of cases, resection of half the stomach only, from the pylorus halfway up both curvatures, is adequate, combined with vagotomy if the fasting juice is highly acid.

COMMENT

There has been a recent tendency to recognize the fact that resection of four-fifths of a normal stomach is a treatment needlessly drastic to cure a small ulcer. Various operations, therefore, have been invented in attempts to solve this problem. Small intestine and colon have been implanted into the interval between fundus and pylorus in attempts to remake a body for the stomach; Aylett's operation was devised to keep most of the stomach intact; in one variety of it only the hormone-secreting pylorus is removed. Vagotomy was introduced by Dragstedt, who at first did not have good results, owing to the weakness of tone and contraction of the vagotomized stomach, which, therefore, demands a really permeable pylorus or other exit. But vagotomy *with* gastrojejunostomy is a sound operation and one that I often perform. If vagotomy is done it must *never* be done alone, but always combined with either gastrojejunostomy or some form of gastrectomy with a good free anastomosis. The indiscriminate performance of vagotomy with gastrojejunostomy in all cases of duodenal ulcer is to be deprecated. Recent published results show that it is not an operation to be done as a routine "for all cases of hyperacidity." Vagal and hormonal hyperacidity must be differentiated; and for patients with vagal hyperacidity (whose acidity is high only in the fasting juice) it is an excellent operation. May not one come to a conclusion, therefore, about the right operation to do in each individual case?

1. For high fasting juice acidity, vagotomy with gastrojejunostomy.
2. For high acid throughout, vagotomy with removal of half the stomach only, eliminating the pyloric secretion of gastrin.
3. For high acid in the digestive period only, half-gastrectomy without vagotomy.
4. For low acidity throughout: Is the acidity low because of gastritis, and if so, would vagotomy with gastrojejunostomy be enough? Or is the acidity really low, and would gastrojejunostomy alone be advisable? If gastritis is proved, such cases really belong to Class 2.

In view of these considerations, should not vagotomy with a modified gastrectomy (pyloric half only) be adopted as the standard, instead of removal of four-fifths of the stomach? Storer, Woodward and Dragstedt[5] observed that vagotomy protected half of a series of experimental dogs from Mann-Williamson ulcers, whereas resection of the pyloric antrum protected two-thirds, and the two procedures combined protected all but 1 of the dogs. Crile[6] reported that the results he obtained from vagotomy with gastrojejunostomy were superior to those from high gastrectomy. Dragstedt[7] reported that in several cases of vagotomy with gastrojejunostomy there was recurrence of hyperacidity, and stated that antral resection would have prevented this, an opinion with which I agree. Most gastric surgeons now adopt vagotomy as the treatment of choice for stomal ulcer after gastrectomy.

Taking all these together, and adding to them what is known of the twofold physiology of gastric secretion, one is led to the conviction that the *standard* operation for duodenal ulcer should be vagotomy with hemigastrectomy, rather than high gastrectomy. In some cases vagotomy with gastrojejunostomy is sufficient; in some it is possible that gastrojejunostomy alone is enough. Personally, however, I have for years rejected high gastrectomy as unnecessary except in some cases of gastric ulcer or carcinoma, and an occasional case of high fasting and digestive acidity with duodenal ulcer in which the diaphragm is very high and vagotomy by the abdominal route is likely to be difficult.

High gastrectomy has a definite mortality rate of perhaps 3 per cent, and is followed by stomal ulcer in at least 6 per cent of cases. Moreover, high gastrectomy is often followed by a dumping syndrome, which may be better in a few months but sometimes persists for a long time. Vagotomy combined with hemigastrectomy has not yet been followed up long enough to yield comparable figures; but at least its mortality approaches 1 per cent or less, and it is far less liable to a dumping syndrome. It is probable that its ultimate rate of association with stomal ulceration will be far less than that of gastrectomy, for in over 70 per cent of cases of gastrectomy in which stomal ulcer developed, vagotomy produced results classified as "excellent," the ulcer having almost certainly healed (Walters and others[8]). Johnson and Orr[9] obtained good results in 95 per cent of their cases of vagotomy plus two-thirds resection of the stomach, and only 0.8 per cent of the patients were unrelieved. Weinstein and his associates[10] reported 155 cases with no recurrence after gastrectomy plus vagotomy.

Above all, vagotomy plus hemigastrectomy, when done as has been suggested, is an operation dependent on physiologic knowledge; it is a physiologic gamble. Recently Bolman and Lloyd[11] have published a remarkable series of 316 cases, in which two-thirds of the patients underwent vagotomy and gastrojejunostomy, and one-third vagotomy and hemigastrectomy. Thus far there have been no recurrences, and there was no operative mortality in the latter group. In the gastrojejunostomy group there were 11 recurrences (5 per cent), all relieved by gastrectomy, and in this group there was 0.5 per cent mortality (1 per cent).

Bolman and Lloyd end their article with these words of wisdom: "Since recurrences following resection depend on the presence of intact vagi, and recurrences following vagotomy depend on the presence of the antrum, gastric hemiresection combined with vagotomy would seem to be the operation of choice in the treatment of duodenal ulcer." With that opinion I heartily agree, and have followed this routine for several years, with consistently good results.

One further word—how shall the gastrectomy be finished? According to Polya (antecolic or retrocolic), or according to Billroth I? Of late the Billroth I procedure has been coming into fashion again.* It is not always easy to do without tension, however, and it allows the gastric acid unhindered access to the mucosa, near to which there has just been an ulcer.[12] Personally I prefer the antecolic Polya procedure, even for a hemigastrectomy.

SUMMARY

In the operative treatment of duodenal ulcer the vagal and hormonal secretions of acid by the gastric mucosa must be considered separately. Highly acid fasting juice demands vagotomy; high acidity in the digestive period is adequately treated by removal of the pyloric half of the stomach only; high acid throughout demands both vagotomy and hemigastrectomy, the combination of which must be reckoned as the standard operation for duodenal ulcer with hyperacidity.

RÉSUMÉ

Dans le traitement chirurgical de l'ulcère duodénal, il est indispensable de différencier les sécrétions du vague et des hormones de celles de l'acide provenant de la muqueuse gastrique. Une hyperacidité à jeun requiert une vagotomie; par contre une forte acidité durant la digestion nécessitera seulement une hémigastrectomie;

---

*Briggs, Beale, and Hastings noted that 10 per cent of their Billroth I operations had to be changed to provide a jejunal anastomosis instead of a duodenal one. Stomal ulcer is more common after Billroth I (*Ross and Meadows, Surgery* 32:426, 1952).

enfin, une hyperacidité constante exigera à la fois une vagotomie et une hémigastrectomie, cette combinaison devant être considérée comme l'opération-type de l'ulcère duodénal avec hyperacidité.

ZUSAMMENFASSUNG

Bei der operativen Behandlung des Zwölffingerdarmgeschwürs ist eine getrennte Berücksichtigung der Säureproduktion der Magenschleimhaut notwendig, je nachdem sie vom Einfluss des Vagus oder der Hormone abhängt. Hohe Säuerewerte im Nüchternsekret erfordern die Resektion des Vagus. Für hohe Säurewerte in der Vandauungsperiode ist die Resektion der pylorischen Hälfte des Magens allein eine ausreichende Behandlung. Durchweg hohe Säurewerte erfordern Resektion sowohl des Vagus als des halben Magens. Diese Kombination muss als das Standardverfahren in der chirurgischen Behandlung des Zwölffingerdarmgeschwürs mit Hyperazidität angesehen werden.

SUMARIO

No tratamento operatório da úlcera duodenal, a secreção vegal e hormonal de ácido pela mucosa gâstrica deve ser considerada separadamente. O conteúdo jejunal altamente ácido exige uma vagotomia; a alta acidez no período digestivo é adequadamente tratada pela remoção da metade pilórica do estômago; a alta acidez *permamente exige tanto uma vagotomia* como hemigastrectomia, cuja combinação deve ser reconhecida como a operação padronizada para a úlcera duodenal com hiperacidez.

RIASSUNTO

Nella cura chirurgica dell'ulcera duodenale bisogna considerare separatamente la secrezione vagale e quella ormonale del succo gastrico. Un'alta acidità a digiuno richiede la vagotomia; un'alta acidità nella fase digestica può essere curata efficacemente con la resezione della metà pilorica dello stomaco; un'alta acidità in entrambe le condizioni richiede la vagotomia e l'emiresezione, associazione che può essere considerata l'intervento di elezione in tutte le ulcere duodenali con iperacidità.

REFERENCES

1. Wright, G.: Brit. J. Surg. 22:435, 1935; Walters, W.: Ann. Surg. 126:17, 1947.
2. Somervell, T. H.: *Brit. J. Surg. 33:146, 1945.*
3. Uvnäs: Acta Physiol. Scand., 4, supp. 13, 1942.
4. Edkins: J. Physiol. 34:183, 1906.
5. Storer, E. H.; Woodward, E. R., and Dragstedt, L.: Surgery 27:526, 1950.
6. Crile, G.: Surg., Gynec. & Obst. 92:309, 1951.
7. Dragstedt, L.: Ann. Surg. 140:396, 1954.
8. Walters, W., and others: Arch. Surg. 70:829, 1955.
9. Johnson, H. D., and Orr, J. M.: Lancet 1:253, 1953.
10. Weinstein, M., and others: Gastroenterol. 22:192, 1952.
11. Bolmar, J. L., and Lloyd, T.: Arch. Surg. 70:833, 1955.
12. Bjorneboe, M.: Acta Med. Scand. 141:16, 1951.

In the physician or surgeon no quality takes rank with imperturbability.

Educate your nerve centers so that not the slightest dilator or contractor influence shall pass to the vessels of your face under [illegible]sional trial.

[illegible]ler

Management of Leg Ulcers

DOMINGO LUCCA R., M.S.V.C., F.I.C.S.*

CARACAS, VENEZUELA

RELATIVELY speaking, there is nothing new in the surgical treatment of leg ulcers. In 1937 Dr. Neal Owens recommended extensive excision of all involved skin and underlying fascia, followed by skin grafting. In March, 1948, Teplinsky, Shapiro and Robertson advocated waiting ten or fourteen days between extirpation of the ulcer and the skin grafting, in order to allow formation of granulation tissue and to obtain better results than with the one-stage operation. In October 1948 Owens and Bethea published a report on the technic of the one-stage operation, claiming excellent results and again pointing out the advantage of immediate skin grafting.

This paper covers 100 cases in which I have operated in the Department of Plastic Surgery at the Hospital Vargas in Caracas during the past four years. In these cases I have performed the one-stage operation (extirpation and skin grafting at the same time). In this series there were also cases of recurrent osteomyelitis in which I utilized a cross leg flap.

Explanation of Cases.—In addition to a complete study of all cases, with routine laboratory tests and clinical examinations, I order a roentgen study and then send the patient to the traumatologist, dermatologist and cardiologist for a thorough checkup. I wish to emphasize that in the beginning I prepared these patients in the usual way with transfusions, high protein diet, vitamins, etc., although I have had numerous difficulties in obtaining blood for my patients. This led to consultation with Dr. Miquel Lairysse (hematologist), with whom I began to experiment on the preoperative cases with cobalt salts, which produce an increase in the red blood cell and hemoglobin counts without causing pathologic change in the other tissues. The results were excellent, and a report on them has been sent to our publishers. In 1 specific case, in which third degree burns on both legs did not heal for eight months, and in which the burns had been treated elsewhere with transfusions and pinchgrafting, I decided to give cobalt salts orally. Approximately one week later, before the red blood cell and hemoglobin count reached a normal level, I noticed that the granulation edges and the pinch grafts had started to heal so quickly that I had to perform a skin-graft procedure. This gave excellent results (case reported later).

Today I give all my patients cobalt salts in the preoperative stage. In those cases in which the red blood cell and hemoglobin counts are low I start administering the cobalt salts and then, without waiting for the patient to reattain a normal count, proceed with application of the skin graft after a waiting period of seven days.

In all of the cases in which I have used this procedure the red blood cell hemoglobin counts reach a normal level between seven and fourteen days after the beginning of treatment with cobalt salts. Transfusions are given only during operation.

Penicillin is routinely given to all patients, starting twenty-four hours before the operation (500,000 units every twelve hours until a total of 3,000,000 units has

---

*Head of the Department of Plastic Surgery of the Hospital Vargas and of the Cancer Institute of Luis Razetti Caracas.

Submitted for publication Jan. 5, 1955.

been given). Very seldom do I give more than 3,000,000 units, since this quantity has proved sufficient.

Treatment.—In my experience, the most logical operation for ulcer of the extremities is extirpation of the ulcer with all surrounding scar tissue, including dissection of the deep fascia and followed by skin grafting in one stage, as Dr. Owens has advocated since 1937.

Surgical Procedure.—With the patient under general anesthesia and lying face down on the operating table, and a pneumatic tourniquet applied to the affected extremity, complete excision of the ulcer, scar tissue and deep fascia is carried out, the muscles being left exposed along with the tendons. Subsequently a thick half-thickness skin graft taken from the back (usually taken with the Brown electric dermatome except when one drum of skin will cover the defect, and then a Padgett dermatome is used) is placed over the defect and sutured to the edges of the wound with running sutures of No. 40 dermalion. This is done without basting the graft to the underlying tissues. The graft is then covered with a layer of Owens surgical rayon impregnated with plain petrolatum, and a routine pressure dressing is applied. The first change of dressing is done on the fifth postoperative day, and then Furacin dressings are applied. When all sutures have been removed, plain adhesive tape is applied over the graft beneath an ace bandage. At this time the patient is instructed to start circulatory exercises. The adhesive tape is left in place for six to eight days. The patient is warned that a great amount of brown secretion will come through the dressings. The adhesive tape is easily removed after eight days and the grafte site cleansed with ether. If at this tin the graft is not completely healed, adhesive tape is again applied. If after this minor areas of granulation tissue a e seen, a Furacin rayon dressing is applied. U.S.P. cold cream and supportive dressings are then applied until stabilization of the graft is obtained.

Treatment of ulcers associated with recurrent osteomyelitis of the tibia is carried out by saucerization of the osteomyelitic area. Eight days later a cross leg flap, raised from the uninvolved leg, is brought to the defect resulting from excision of the osteomyelitic area, where it is firmly attached by marginal sutures. Excision and transfer of the flap are done in one stage. After twenty-one days the base of the pedicle is severed from the donor site and firmly attached to the border of its new location. On the fifth day after severance of the pedicle the patient is discharged from the hospital, ambulatory, with a supportive dressing on both legs. These dressings are kept on until stabilization of the flap and graft is completed.

REPORT OF CASES

CASE 1 (Fig. 1*A*).—M. P., a white woman, aged 65, had had a varicose ulcer of the left leg for fourteen years. It had been treated several times with ointment and rest. Five years earlier she had had a high ligation with sclerotization of the varicose veins, without result. On Sept. 14, 1951, the ulcer and scar tissues were excised from the lower third of the leg to the dorsum of the foot, and a half-thickness skin graft was applied to the resulting defect. The graft stayed healed and stable until the patient's death from cerebral hemorrhage on July 8, 1953.

CASE 2 (Fig. 1*B*).—N. A., a white woman, aged 52, had had varicose veins and ulceration of the right leg for twenty-one years. On Aug. 15, 1951, a high ligation with sclerostization of the varicosities was done. On November 26 the scar and underlying tissue were excised from the middle third of the leg down to the dorsum of the foot and the resulting defect grafted. The pati was charged
the hospital with raf perfect
Four mon r ig to
raft bec the
but wi re
l. T d

CASE 3 (Fig. 1*C*).—L. A., a Negro, aged 21, during treatment in a mental hospital, acquired an ulceration covering almost the entire leg. On April 5, 1951, the entire affected area was excised and a skin graft done. The graft "took" perfectly, and the patient was discharged from the hospital twenty-one days later. The graft has been stable since, as shown in C and D (Fig. 3), taken two years later.

CASE 4 (Fig. 1*D*).—F. L., a white woman, aged 52, had had a varicose ulcer of the middle portion of the leg for fourteen years. The patient stated that the ulceration, under local treatment with ointment and bed rest, had healed on three occasions, only to recur. On April 8 the entire ulcer and all scar tissue were excised and a skin grafting operation performed. The graft remained stable up to the time of the patient's discharge from the hospital, when a small reaction on the superior part of the graft occurred owing to suture material reaction. After removal of the sutures healing occurred, and there has been no further complication.

CASE 5 (Fig. 1*E*).—A. G., a white woman, aged 42, during a pregnancy in 1929, had an attack of lymphangiitis, and an ulceration developed on the external side of the right ankle. She was treated with local care and rest, and the ulcer healed. Eleven months later it recurred and, in spite of all kinds of treatment, did not heal. May 9, 1952, the ulcer and scar tissue were removed and a skin graft taken from the middle of the back with a dermatome, applied over the defect and sutured with No. 40 dermalon. The graft "take" was perfect, and the patient was discharged on the twenty-first day. Subsequently some reaction from the suture material occurred, but since removal of the offending sutures the graft has been stable.

CASE 6 (Fig. 1*F*).—M. F. C., a white woman, aged 63, had a varicose ulcer on the internal side of the left malleolus. Eight years earlier she had had a high ligation and sclerotization of the varicose veins with cicatrization of the ulcer, but ulceration recurred eight months later. On Jan. 4, 1951, extirpation of the ulcer and skin grafting were done. The patient was discharged sixteen days later. (Fig. 6) shows the graft two years after this procedure. On May 7, 1953, this patient again reported to me, presenting an ulceration of the right leg. Excision and skin grafting were advised, but the ulceration healed with rest and local care and the patient decided to postpone surgical treatment.

CASE 7 (Fig. 1*G*).—A. L., a white man, aged 35, had a chronic ulcer of the left leg of ten years' duration, with an equinus defect of the foot. On May 23, 1952, extirpation of the ulcer was performed, followed by a skin grafting. In February of this year, correction of the pedal defect was done by Dr. Cesar Acosta (traumatologist) and the graft remained stable during the operative trauma. At the time of writing the patient is doing his usual work.

CASE 8 (Fig. 1*H*).—T. M., a Negro, aged 23, had a chronic ulcer of the left leg of twelve years' duration, which had healed on many occasions only to reopen. When seen by me the ulcer was almost healed but the scar tissue covered the entire leg from the knee to the dorsum of the foot. On April 7, 1951, a lumbar sympathectomy was performed, and on May 7, one month later, extirpation of the affected tissues of the left leg and skin grafting were carried out.

CASE 9 (Fig. 1*I*).—D. R., a Negress, aged 38, had a 10-year-old varicose ulcer on the internal surface of the left ankle. High ligation and sclerotization of the veins with cicatrization of the ulcer had been done in 1950. In 1952 the ulcer reopened. In October of that year, extirpation and skin grafting were carried out. The patient was discharged from the hospital completely healed.

CASE 10 (Fig. 1*J*).—E. F., a Negress, aged 36, had had a varicose ulcer on the external surface of the left leg for sixteen years. In 1950 a high and low sclerosing procedure had been done, with ligation of the veins. On May 7, 1951, extirpation of the ulcer and scar tissues was carried out and a skin graft taken from the thigh immediately applied to the defect and sutured to the edges of the wound with running stitches of No. 40 dermalon. The first change of dressing was done on the fifth postoperative day. The graft took perfectly, and the patient was discharged from the hospital in perfect condition. The graft has remained stable, and the patient is now doing her usual house work.

CASE 11 (Fig. 1*K*).—S. Z., a white woman, aged 33, presented ulceration of the middle and inferior portion of the left leg, which she stated had been present for fifteen years. In 1939 a sympathectomy had been performed, with some improvement, but the ulcer remained unhealed. In 1951, when first seen by me, it was still unhealed. Feb. 26, 1951, extirpation of the scar tissues from the middle

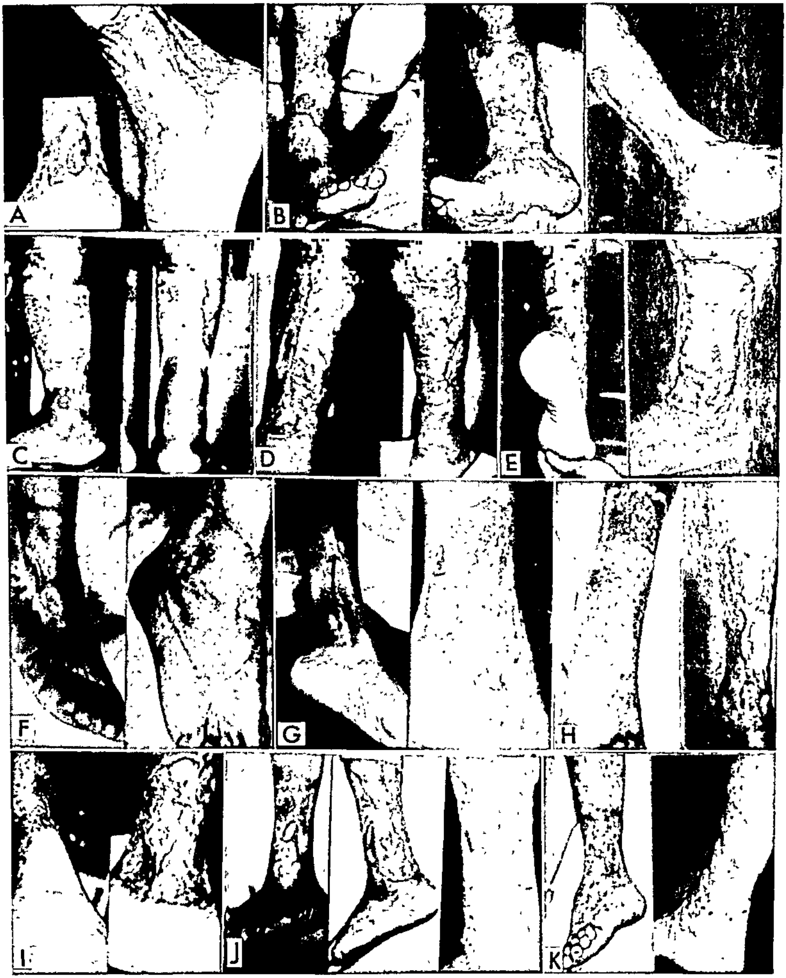


Fig. 1.—*A*, case of M. P., a white woman aged 65. *B*, case of N. A., a white woman aged 52. *C*, case of L. A., a Negro aged 21. *D*, case of F. L., a white woman aged 52. *E*, case of A. G., a white woman aged 42. *F*, case of M. F. C., a white woman aged 63. *G*, case [illegible] A. [illegible] a white man aged 35. *H*, case of T. M., a Negro aged 23. *I*, case [illegible] egress [illegible] of E. F., a Negress aged 36. *K*, case of S. Z., a w[illegible]

portion of the leg to the dorsum of the foot, with skin grafting, was done. When the patient was discharged the graft was stable and has remained in perfect condition up to the time of writing.

CASE 12 (Fig. 2*A*).—E. F., a Negress, aged 50, after five months of hospitalization and treatment with ointment and antibiotics, was transferred to my service at the Hospital Vargas. An ulcer of the left leg had been present for eight months. The surgeon in charge of this patient wanted to do a lumbar sympathectomy at the time I operated on the leg. This was done on March 20, 1951. The graft "take" was only 80 per cent. At the time of the first dressings, multiple hematomes appeared below the graft. It seemed to me that the lumbar sympathectomy had produced a great deal of oozing beneath the graft. Subsequently a part of the achilles tendon was removed and a new skin graft applied. Although the graft was not completely healed and stable, the patient insisted upon being discharged from the hospital. A check-up one year later showed complete cicatrization.

CASE 13 (Fig. 2*B*).—R. D., an Indian woman, aged 34, had had a postphlebitic ulcer on the internal surface of the left leg for two years. On March 8, 1953, a lumbar sympathectomy was done, and a few days later a high and low ligation, with sclerotization of the varicose veins was performed. The ulcer did not heal, so the patient was referred to me. On April 18 extirpation and skin grafting were performed. The graft "took" 95 per cent. A small area, about 2 cm. in diameter, in the middle of the graft was lost, and in spite of all local and general care did not heal. A month later a new skin graft was applied, and this was also lost. The patient refused further surgical treatment and was discharged with ulceration of the graft. On June 8, with the ulceration still present, there was a local hemorrhage at the site of ulceration. Examination revealed canalization of the varicosities at the juncture of the superior part of the graft and the leg. Local sclerotization with sodium morrhuate was done. A few days later cicatrization of the ulceration occurred, and it has remained healed for two months.

CASE 14.—A. M., a white woman, aged 35, was seen by me on Aug. 9, 1952, with a sclerotic cuff involving the right leg from the knee to the superior portion of the ankle, due to repeated attacks of acute lymphangiitis. In spite of antibiotics these attacks recurred every three days. Although the cuff was not ulcerated, it was my opinion that something must be done to stop these attacks, which had made the patient an invalid for the past eight months. Therefore, on August 12, the cuff was removed and a skin graft applied. The graft "take" was perfect, and the patient was discharged with the graft in ideal condition. Since this procedure no further attacks of lymphangiitis have occurred, and the graft has remained stable.

CASE 15 (Fig. 2*C*).—C. U., a Negress, aged 50, had an ulcer of the external aspect of the right leg. She also had high blood pressure. On March 12, 1951, extirpation of the ulcer and skin grafting were done in conjunction with a lumbar sympathectomy. In *B*, Figure 15, the graft is shown with a hematoma under it. This film was taken on the fifth day. Drainage of the hematoma was carried out and a new dressing applied. The patient's relatives insisted upon her discharge from the hospital, and she has not been heard from since that time.

CASE 16 (Fig. 2*D*).—J. V. L., a white man, aged 78, a diabetic patient, had an ulceration on the inferior portion of the right leg. On Sept. 11, 1952, extirpation of the ulcer was done. In this case, because of the patient's age, fourteen days were allowed to elapse before performing the skin graft. For the same reason, the patient's condition during operation was not at all satisfactory. Nevertheless, the graft "take" was 100 per cent perfect, and the patient was discharged from the hospital in perfect condition. The graft has remained stable, although on April 8, 1953, the patient fell against the edge of the curb and injured it. With local treatment, however, it healed in a few days.

CASE 17 (Fig. 2*E*).—E. F., a white man, aged 28, was the victim of a shotgun blast in 1941, while on a hunting trip. The external surface of the inferior portion of the leg was involved. The wound healed by secondary intention, producing a scar with retraction of the tendons. In 1951 the scar became ulcerated and showed no tendency to heal. In October, 1952, I saw the patient, there was an ulceration measuring about 4 to 6 cm. on the external aspect of the inferior portion of the left leg. Roentgenograms showed a great number of lead pellets imbedded in the tissues. In September extirpation of the ulcer was done, with removal of all possible lead pellets,

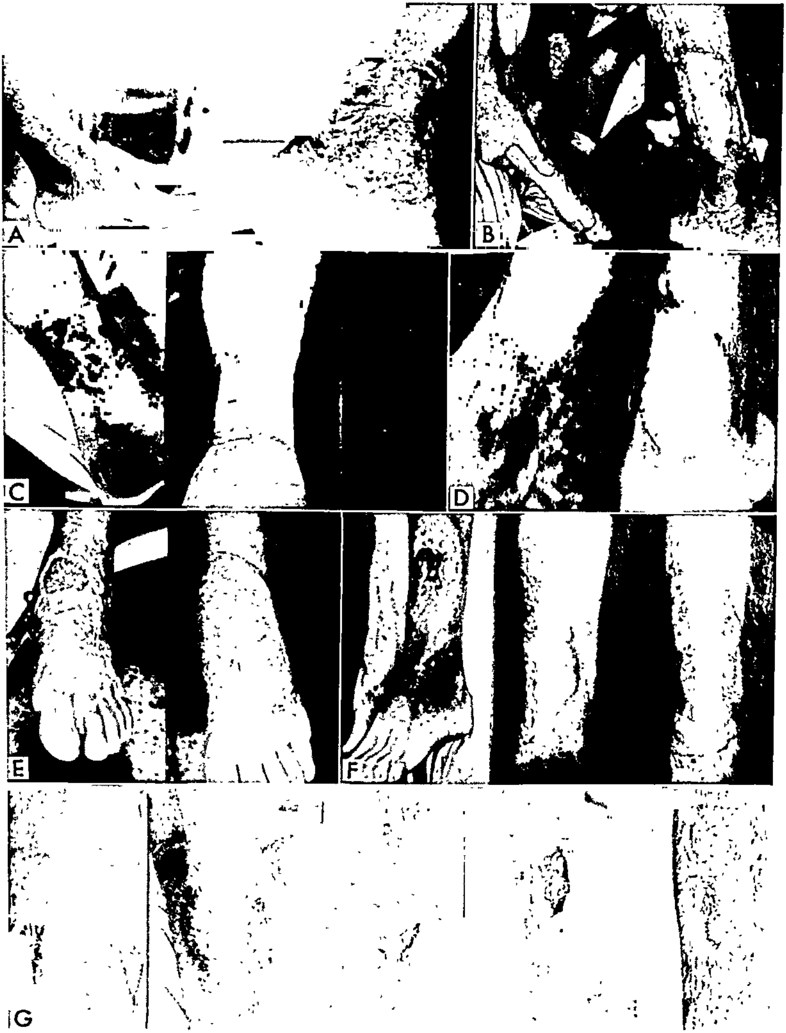


Fig. 2.—*A*, case of E. F., a Negress aged 50. *B*, case of R. D., an ed 34. *C*, of C. U., a Negress aged 50. *D*, case of J. V. L., a white man aged F., a man aged 28. *G*, case of J. G., a white man aged 25. *H*, case of F. text for details.)

liberation of the tendons and application of a cross leg flap. Twenty-one days later the flap was severed. The patient was discharged five days thereafter in perfect condition.

CASE 18.—F. M. O., a white man aged 25, suffered an injury of the foot in 1947, and ulceration developed on the anterior surface of the left ankle. In 1950 lumbar sympathectomy was done, but the ulcer remained. On Aug. 10, 1951, the ulcer was extirpated, the tendons exposed and a cross leg flap applied. On September 1 the base of the flap was severed, and the patient was discharged in perfect condition. Subsequently I wished to improve the appearance of the flap, but the patient refused, stating that he was satisfied with the results.

CASE 19 (Fig. 2*F*).—J. G., a white man, aged 25, suffered an automobile accident in 1940, which caused loss of skin over the tibia. A cast had been applied and the wound had healed, but five months later it became ulcerated and had remained unhealed in spite of all local treatments. Roentgenograms revealed ostoeomyelitis of the tibia. This was treated with saucerization and a cross leg flap. On Jan. 1, 1951, it was noted that the flap had taken well and severance of the base of the flap was done. The patient was discharged ten days later in perfect condition, but on April 8, 1952, he returned with ulceration of the edge of the flap. On December 8, extirpation and skin grafting were carried out, and the patient was discharged twenty days later in perfect condition. The area has remained healed since that time.

CASE 20 (Fig. 2*G*).—L. A., a white man aged 38, had had osteomyelitis of the right tibia for four years. On Sept. 2, 1952, saucerization of the tibia was performed, and ten days later the patient was referred to me. On September 9, a cross leg flap was applied, and twenty-one days later the base of the flap was severed. Five days thereafter the patient was discharged with the flap in perfect condition. There has been no recurrence of the osteomyelitis.

CASE 21 (Fig. 2*H*).—F. T., a white man aged 20, had recurrent osteomyelitis of the right leg. In 1940, saucerization of the tibia was performed. For two years the patient had no trouble, but in 1951, after an injury to the leg, there was a recurrence of the osteomyelitis. Roentgenograms showed a sequestrum of the midportion of the tibia. In August of the same year, saucerization of the tibia was done and a skin graft applied over the bone. The graft "took" perfectly, and the patient was discharged. Six months later he returned with the graft almost lost. On Jan. 8, 1952, the graft was extirpated and a cross leg flap applied. Twenty-one days later the base of the pedicle was severed. There has been no recurrence of the osteomyelitis.

SUMMARY

1. Of the 100 cases mentioned in this report, 75 per cent were cases of chronic varicose ulcer.

2. No attempt has been made to mention anything relative to the etiologic or the pathologic aspects of the ulcer, because this has been extensively and well-covered in many papers on leg ulcer.

3. In all cases of chronic varicose ulcer in which sclerosis has been done, the author has been unable to find the sclerotic veins at operation or in the anatomopathologic reports.

4. In cases in which sympathectomy was performed at the time of the grafting the results were not as satisfactory as in those cases in which the sympathectomy was done prior to the skin graft or in which no sympathectomy was done.

5. Recurrence of ulceration has occurred in about 7 per cent of the cases, but is due mainly to insufficient removal of scar tissue and because the fact that the patient did not take care of the graft as instructed.

RESUMEN

1. En los 100 cases comunicados, el 75 por ciento tenían úlceras varicosas crónicas.

2. No se han hecho intentos para mencionar nada relativo de los aspectos etiológicos o patológicos de la úlcera, ya que ésto se encuentra tratado ampliamente en muchos artículos sobre úlcera dela pierna.

3. En todos los casos de úlcera varicosa crónica en los cuales se hizo ligadura y esclerosis, no se han encontrado las venas

esclerosadas en la operación o en las comunicaciones anatomopatológicas.

4. En los casos en los que se hizo simpatectomía al mismo tiempo que injerto, los resultados no son tan satisfactorios como en aquellos en los cuales se hizo simpatectomía antes del injerto cutáneo, o en que no se hizo simpatectomía.

5. Se produjo recidiva de la úlcera en 7 por ciento de los casos, lo cual se debió a la extirpación insuficiente del tejido cicatricial, a causa de que el paciente no tuvo cuidado del injerto.

RIASSUNTO

1. Dei 100 casi riferiti in questo lavoro, 75 erano ulcere varicose.

2. L'Autore ha trascurato di interessarsi degli agenti etiologici o dei caratteri anatomo-patologici delle ulcere osservate, giacchè tali punti sono stati accuratamente trattati in molti altri lavori sull'argomento.

3. Ogniqualvolta, nella cura delle ulcere varicose, era stata eseguita la legatura e la sclerosi delle vene, l'autore non riuscì ad identificare le vene sclerotiche nè all'atto dello intervento nè con la ricerca anatomo-patologica.

4. Nei casi in cui fu eseguita una simpatectomia contemporaneamente ad un trapianto di cute, i risultati furono meno soddisfacenti di quelli ottenuti in quei casi in cui la simpatectomia precedette il trapianto.

5. Le ulcere recidivarono in 7 casi su cento, sopratutto perchè l'asportazione del tessuto cicatriziale fu insufficiente e perchè il paziente trascurò di attenersi alle istruzioni ricevute.

ZUSAMMENFASSUNG

1. Bei 75% der hier berichteten 100 Fälle handelte es sich um chronische Krampfadergeschwüre.

2. Auf die Besprechung der [illegible] und der Pathologie des U[illegible] schwürs wird verzichtet, weil diese Themen in vielen Arbeiten schon ausführlich unt gut behandelt worden sind.

3. In keinem Fall von chronischem Krampfadergeschwür, wo Unterbindung und Sklerosierung ausgeführt worden waren, ist es dem Verfasser gelungen, die sklerotischen Venen bei der Operation oder im anatomisch-pathologischen Präparat zu finden.

4. Bei Fällen, in denen eine Sympathektomie gleichzeitig mit einer Hautplastik ausgeführt wurde, waren die Ergebnisse nicht so zufriedenstellend wie in denen, wo die Sympathektomie der Hautplastik vorausging oder wo keine Sympathektomie ausgeführt wurde.

5. Ein Wiederauftreten von Geschwüren wird in etwa 7% der Fälle beobachtet und ist im wesentlichen auf die unzulängliche Entfernung des Narbengewebes und auf die Ausserachtlassung der dem Patienten auferlegten Vorschriften zur Behandlung der Plastik zurückzuführen.

RÉSUMÉ

1. Parmi les 100 cas mentionnés dans ce rapport, 75 furent des cas d'ulcère variqueux chronique.

2. Aucune tentative n'a ètè faite pour traiter des points de vue étiologiques ou pathologiques parce que ceci a été amplement bien développé dans maintes publications sur l'ulcère de jambe.

3. Dans tous les cas d'ulcère variqueux chronique où la ligature et la sclérose ont été effectuées, l'auteur a été incapable de trouver les veines sclérosées soit à l'opération soit dans des rapports anatomopathologiques.

4. Les résultats ne furent pas aussi satisfaisants quand la sympathectomie fut faite au moment de la greffe de peau qu'av[illegible] greffe.

5. L[illegible] [illegible]diva [illegible] [illegible]on [illegible] 7% des [illegible]

que le patient ne prit pas soin de la greffe comme on le lui apprit.

SUMARIO

1. Dos 100 casos apresentados neste trabalho, em 75% tratava-se de úlceras varicosas crônicas.

2. Não foi feita qualquer tentativa para mencionar qualquer causa relativamente à etiologia ou aspectos patológicos das úlceras, por ter tal assunto sido exaustivamente estudado em muitos trabalhos sôbre ulceração das pernas.

3. Em todos os casos de úlceras crônicas varicosas em que foi feita a ligadura e a esclerose, o autor não conseguiu encontrar as veias escleróticas no operação ou no relatório anátomo-patológico.

4. Nos casos em que foi feita a simpatectomia por ocasião dos enxêrtos, os resultados não foram tão satisfatórios como naquêles em que a simpatectomia foi feita antes do enxêrto cutâneo e em que não foi feita simpatectomia.

5. A recidiva da ulceração ocorreu em cêrca de 7% dos casos, sendo devida principalmente à retirada insuficiente do tecido cicatricial e porque os pacientes não cuidaram devidamente dos enxêrtos, conforme instruidos.

BIBLIOGRAPHY

Owens, N.: Treatment of Chronic Varicose Ulcers of the Lower Extremities, New Orleans M. & S. J. 89:483 (March) 1937.

Teplitsky, L. L.; Shapiro, R. N., and Robertson, G. W.: Radical Excision and Skin Grafting of Leg Ulcers, J. Plast. & Reconstruct. Surg. 3:189 (March) 1948.

Owens, N. and Bethea, H.: Surgical Management of Chronic Varicose Ulcers, J. Plast. & Reconstruct. Surg. 3:633 (Nov.) 1948.

Padgett, E. C., and Stephenson, K. S.: Plastic and Reconstructive Surgery. Springfield, Ill.: Charles C Thomas, Publisher, 1948.

Smith, F.: Plastic and Reconstructive Surgery: Manual of Management. Philadelphia: W. B. Saunders Company, 1950.

* * *

As alchemy passed, a new science was born . . . The thought that life could be made to exist forever occupied the minds of many men of intellect . . . Modern investigation finds that this strange delusion existed in every European country, causing men, often those of genius, to endure privation and seclusion which ended only in death in the search for the elixir of life that would promote an existence which, if not eternal, would continue much beyond the span of ordinary life . . . The idea of eternal life died hard, for we find it cropping up many times in a search for a panacea for all ills, which was believed to renew youth and prolong life indefinitely.

—*Atkinson*

PVP-Iodine: History, Toxicity and Therapeutic Uses

HERMAN A. SHELANSKI, Ph.D.†

AND

MORRIS V. SHELANSKI, M.D., C.M.*

PHILADELPHIA, PENNSYLVANIA

POLYVINYLPYRROLIDONE (povidone)[1]** meets the criteria for a successful expander of blood volume. It is one of the final products of a series of reactions starting with acetylene and formaldehyde and is similar in configuration to the breakdown products of hemin except that there are many more pyrrole rings in PVP, and the linkage between the rings is by means of vinyl groups bridging the nitrogens rather than methene bridges joining the adjacent carbons.

Physical Properties.—Povidone (PVP) is a nearly white powder, readily soluble in water and many organic solvents. It is stable to heating in air at 100 C. for at least sixteen hours. The powder is hygroscopic, but otherwise stable, and can be stored indefinitely.

Physiologic Properties. — Povidone resembles the proteins of natural plasma in its capacity for binding water and adsorbing other substances. These properties have been attributed to the presence of the amido (-CO-N-) groups. Because of its high collodial osmotic pressure, PVP (2.5 per cent, later 3.5 per cent) in physiological solution of sodium chloride (periston) was used extensively by the Germans in the treatment of shock.[2] PVP, after intravenous administration, was shown by Weese and Hecht[3] to assume the carrier functions of the plasma proteins. Bennhold, Schubert and others[4] demonstrated by cataphoretic and diffusion experiments that, in addition to its physical resemblance to plasma proteins, PVP shows a biologic resemblance by adsorbing physiologic and nonphysiologic products, including bilirubin, atabrine, Vitamins B-1, C, and P and numerous dyes, as well as the toxins of diphtheria, tetanus and botulinus. In addition, intravenously injected PVP exhibits another characteristic of plasma protein. This is the so-called embathic effect, which is the ability to render diffusible coarsely dispersed dyes such as congo red.[5]

Pharmacologic Properties. — PVP displays a retarding and potentiating effect on a large number of parenterally administered drugs. This effect was first observed in Germany by Duttmann,[6] who used it to prolong the action of pontocaine in peridural anesthesia. Further advances in the utilization of this characteristic have been made in France, England and the United States, especially in intramuscular antibiotic preparations.

Schubert and his associates have claimed that PVP detoxifies *in vivo* certain dyes and certain toxins, including those of diphtheria, botulinus and tetanus. They postulated a mechanism in which the PVP protects the liver by diverting the toxins to the kidney and by increasing the rate of excretion through that organ into the urine by virtue [illegible] its embathic effect.[7]

D[illegible]ry [illegible] In v[illegible] of

---

† Deceased.

* Research Fellow, Philadelphia General Hospital; Director of the Industrial Toxicological Laboratories, Philadelphia, Pa.

** Povidone is distributed by the Isodine Pharmacal Corp., Denver, Delaware.

Submitted for publication May 9, 1956.

the detoxifying properties of PVP, Shelanski, Cantor and Shelanski[8] studied its effects upon inorganic toxic materials. One of the first of such materials studied was iodine in Lugol's solution and as a tincture.

In preliminary studies of acute oral toxicity on albino rats, Lugol's solution and tincture of iodine in combination with PVP were shown to be less toxic than was either solution alone. Altered physical properties were produced by the presence of PVP. Most obvious was the altered color of the solution. Instead of the red or purplish color expected, a rich mahogany color was obtained. Coupled with this was the observation that the vapor pressure of the iodine was considerably reduced. It was logical to assume that the iodine was undergoing some alteration in the presence of the PVP. In attempting to titrate back the iodine, it was discovered that not all the iodine could be recovered. Repeated extractions with chloroform were unsuccessful in retrieving the missing portion of iodine. Further additions of Lugol's solution or tincture to the iodine-containing PVP, however, resulted in no similar loss of iodine. At this point, Shelanski and Shelanski theorized that the lost iodine was bound to the PVP in the form of organically bound iodide, which should act to stabilize iodine in the same manner as potassium iodide in Lugol's solution. They prepared an aqueous solution of iodine combined with PVP without the aid of the usual solvents or solubilizing substances. Thus, it was shown that PVP itself acts as a carrier of iodine in water solutions. It was later shown that iodine vapors are directly soluble in PVP powder.

Chemical Nature of PVP-Iodine. — It was shown that PVP acts in a manner similar to plasma protein in combining with iodine. A small fraction (less than 1 per cent) of the iodine is converted directly into inorganic iodide. The reaction occurs at the ends of the PVP molecules, where an acid environment prevails. The amount of inorganic iodide formed is determined by the number of free end groups and thereby by the molecular weight of any given PVP sample. About 30 per cent of the iodine is converted into organic iodide (corresponding to protein-bound iodine). The remainder of the iodine exists as free elemental iodine. The free iodine is made soluble by the organic iodide. There is still another factor, however, which is responsible for the solubility of the iodine. In Lugol's solution, 2 parts of potassium iodide are required to make 1 part of iodide soluble. In PVP-iodine the proportions are reversed; about 30 per cent of the iodine is converted to iodide, and 70 per cent remains free. The reason for this phenomenon is not completely clear, but it appears that a two-phase system exists. The free iodine actually is in solution in the PVP iodide. The PVP-iodide-iodine complex in its entirety is in solution in the water.

Effectiveness Against Microorganisms. —Cantor and Shelanski proceeded with the *in vitro* assay of PVP-iodine. It was demonstrated that the iodine in PVP-iodine was available to perform the same functions as iodine in tincture or Lugol's solution, namely, its bacteriocidal, viricidal and protozoocidal capabilities had not been decreased. With use of the capacity method[8] developed by Cantor and Shelanski, it was shown that the capabilities of iodine had been prolonged.

Toxicity of PVP-Iodine.—Concurrently these authors, investigating the toxicity of PVP-iodine in mammals, noted that iodine in this form was less toxic than iodine in Lugol's solution or tincture.

The toxicity studies were performed with PVP-iodine solutions containing 1 to 5 per cent iodine and 2 to 10 per cent PVP in distilled water.

Acute Oral Toxicity Study. — Twelve groups of animals, each containing 10 albino rats of the Yale-Sherman-Wistar strain, were used in testing Lugol's solution containing 2.5 per cent free iodine, and an equal amount was used in studying a PVP-iodine solution containing 2.5 per cent free iodine. These rats were observed for two weeks to make sure that they were normal. Litter mates were dispersed throughout all groups of both studies. From twenty-four hours prior to dosing, the animals were given water only. Dosing was performed by means of a rubber catheter introduced via the mouth directly into the stomach. Doses were accurately measured by means of a calibrated syringe. Survival counts were taken daily for two weeks after administration of the iodine solutions. The LD_{50} results were as follows:

Lugol's solution—400 mg. of free iodine per kilogram.
PVP-iodine—1,300 mg. of free iodine per kilogram.

This shows that PVP-iodine is more than three times as safe to use as is Lugol's solution containing an equal amount of free iodine.

Another group of investigators who performed this study obtained an LD_{50} of 107.5 mg. of free iodine per kilogram for Lugol's solution and 962.5 mg. of free iodine per kilogram for the PVP-iodine solution. In these results there is a 9 to 1 ratio with regard to the safety of use of the PVP-iodine solution.

Percutaneous Studies on Intact Skin.—Twenty-five rabbits were prepared by clipping the hair from the back to expose a large area of skin. PVP-iodine, containing 10 per cent PVP and 2 per cent iodine, was applied over an area of 1 square inch on one side of the animal. On the other side a tincture of iodine solution containing 2 per cent free iodine was applied in a similar manner and used as a control. The contact sites were covered with lintine discs, which in turn were covered with waxed paper and held in place with adhesive tape. The patches were scheduled to be left on for ninety-six hours. Within twenty-four hours, however, severe erythema and edema developed in the sites of contact with tincture of iodine, necessitating removal of these patches. No such reactions developed with the PVP-iodine, even though the patches remained in place for the scheduled ninety-six hours. After a two-week period of recuperation the patches were reapplied in an identical manner. Again the tincture of iodine patches had to be removed prematurely because of severe reactions. After forty-eight hours the PVP-iodine patches had produced no cutaneous reactions.

With the same solutions, 200 human subjects were exposed to a similar patch test. As in the case of the rabbits, the tincture of iodine patches had to be removed prematurely (within twenty-four hours) because of complaints caused by the severe cutaneous reactions. The PVP-iodine patches produced no such reactions, even after ninety-six hours of contact, when they were removed.

After two weeks the patches were reapplied in the same manner, and again the reactions to the tincture of iodine were severe within twenty-four hours. No such reactions occurred with the PVP-iodine, even after forty-eight hours.

One hundred volunteer persons were subjected to the repeated insult patch test method of Shelanski and Shelanski.[9] The same solutions of tincture of iodine and PVP-iodine were tested. The patches were scheduled for twenty-four hour contact, every other day, with 15 applications. The tincture of iodine patches were discontinued after the first application because of severe reactions, even though the patches had been remo[illegible] [illegible]thin twenty-four [illegible] No comp[illegible] reactions were caused by the PVP-iodine patches throughout the 15 applications. Even after a challenge application, which was carried out after three weeks and consisted of contact for forty-eight hours, the PVP-iodine elicited no subjective complaints and no visible reactions.

Percutaneous Studies on Damaged Skin.—All the aforedescribed studies were repeated on those rabbits and human subjects in which the skin of the contact sites was purposely damaged by abrasion with coarse sandpaper. In all cases the results were essentially the same. In addition, it was observed that no infections occurred; all the abrasions were healed or in the process of healing when the PVP-iodine patches were removed.

Mucous Membrane Exposures.—Twenty-five rabbits were used to determine and compare the irritating effects of a PVP-iodine solution and Lugol's solution when instilled into the eyes. The PVP-iodine solution contained 10 per cent PVP and 1 per cent iodine. The Lugol's solution contained an equal amount of free iodine. One-half cc. of the PVP-iodine was instilled into the left eye of each of the rabbits and the same amount of the Lugol's solution was instilled into the right eye as a control. The eyes were observed daily for two weeks. The PVP-iodine produced a slight reddening of the conjunctiva which disappeared within two or three days. The Lugol's solution produced severe erythema, edema and progressive corneal damage, which did not clear up within the two-week period of observation.

The effects of repeated daily instillations of the two solutions were studied in a group of 25 guinea pigs and 25 rabbits. It was planned to instill 0.1 cc. of PVP-iodine daily into the left eye of each animal and 0.1 cc. of Lugol's solution into the right eye. The reactions were so severe with the latter that the instillation of Lugol's solution was discontinued after three days. The PVP-iodine, however, produced transitory erythema, which cleared within a few hours. Instillations with the PVP-iodine were continued for the entire fifteen-day period without any significant damage. Two weeks after the fifteenth instillation a challenge instillation was performed with PVP-iodine. The results were identical with those observed before.

A group of 25 human volunteers was used in the next study. The mucous membranes of the throat, including the tonsillar fossae, the palate, the uvula, and the posterior pharyngeal wall were swabbed with approximately 2 cc. of PVP-iodine. The reactions ranged from a stinging sensation, which abated in ten to twenty minutes, to no sensation but a "bad taste." The subjects were examined for reactions every half hour for the first two hours and every hour thereafter for the next four hours. There was a slight reddening of the mucous membranes in about 60 per cent. Forty per cent showed no reaction. The reddening persisted for two hours or less. These studies were repeated daily, fifteen applications being tested on 10 patients, 5 of whom showed no reactions at all to the PVP-iodine and 5 of whom showed reddening after initial application. In none of these patients was there any aggravation of the initial reaction to the PVP-iodine. After two weeks of rest these 10 patients were again treated in the same manner, and the reactions noted were similar to those previously noted.

Effect on Iodine-Sensitive Humans.—Three known iodine-sensitive volunteer subjects were tested with patches of PVP-iodine and Lugol's solution. The skin in contact with the Lugol's solution erupted with a severe reaction, typical of the sensitization-type reactions. None of the patients showed any reaction to the PVP-iodine.

Therapeutic Evaluation of PVP-Iodine.—Except when otherwise noted, PVP-iodine solutions containing 2 per cent free iodine and 10 per cent PVP were used. Two series of patients were treated.* The first series consisted of patients with surface infections, both bacterial and mycotic, of the skin and mucosa. The second series of patients had wounds of the skin or mucosa, and the group included those on whom operations were performed. More than 300 patients were treated.

Series 1: Polyvinylpyrrolidone-Iodine for Treatment of Surface Infection.—A total of 108 representative patients with bacterial and mycotic infections of the skin and mucosa were treated with the unaltered PVP-iodine solution, consisting of varying proportions of iodine and PVP in water. All showed marked improvement within eighteen hours, and in 100, or 94.3 per cent, the condition cleared up within thirty-six hours. In detail the series consisted of 62 cases of bacterial infections of the skin, 23 of sore throat, 12 of mycotic infections of the toes, 6 mycotic infections of the hands, 2 of mycotic infections of the ears and 3 of mycotic infections of the perineal region. Typical case histories are as follows:

CASE 1.—A 24-year-old white man had a history of recurrent sycosis barbae, which had responded slowly to treatment. PVP-iodine was applied to the chin and cheeks without producing any additional irritation of the lesions. Within four hours the patient noted relief from the irritation produced by the infection. Within eighteen hours the lesions had become noticeably drier. PVP-iodine was applied a second and third time after twenty-four hours and forty-eight hours respectively. Complete recovery was noted on the third day after the treatment had been started. During this time the patient was not allowed to shave or wash his face.

CASE 2.—A 32-year-old white man had an infected wound on the dorsal aspect of the right little finger. The wound was purulent, ulcerated and inflamed. Enlarged lymph nodes were present in the epitrochlear and axillary regions. The temperature was 99 F. The wound was cleansed; PVP-iodine was applied, and the wound was dressed. No increased irritation was noted by the patient. After twenty-four hours the temperature was normal. Lymphadenopathy had diminished. The wound itself was dry and clean, and epithelization was in progress.

CASE 3.—A 38-year-old white man had had bilateral mycotic infection of the ears for several months, and all previous treatment had failed. PVP-iodine was instilled into both ears, and a superficial cotton plug was used to close the canals. Relief from itching was noted in one hour. After twenty-four hours reexamination showed desquamation of the epithelium and a decrease in the amount of discharge. The drum appeared almost normal except for some discharge on the surface. A second application of PVP-iodine was made at this time. On the next day, examination revealed that the left ear was completely dry. The right ear still had some discharge, but there was no itching. PVP-iodine was again applied in both ears. Four days after the start of the treatment both ears appeared completely normal. The patient was relieved of itching and has continued well.

CASE 4.—A 21-year-old white man had had gross mycotic infection of the right foot for the past eight years. No previous treatment had produced any relief. On first examination the dorsal aspect of the foot was covered with weeping sores. The patient stated that the itch was so unbearable that he had to scratch almost continuously. PVP-iodine was applied to the lesions, and the foot was bandaged. Twenty-four hours later, reexamination showed a marked decrease in the discharge. The patient volunteered the information that he was able to sleep peacefully, without interruption, for the first time in many years. Daily applications of PVP-iodine were continued for one week. Marked improvement was noted, although the lesions had not completely healed. Tincture of 30 per cent PVP-iodine was prepared and given to the patient for self-treatment. At the time of writing the lesions are minimal and dry. Since they are still present, however, we consider this case a failure.

CASE 5.—A 30-year-old white man complai[illegible] roat of [illegible]k's duration. He [illegible] ten[illegible] ent by his fami[illegible] temperature was 99.9 F., and the cervical lymph glands were swollen and tender. The entire pharynx was markedly injected. The patient's throat was swabbed with PVP-iodine. After twenty minutes the pain had completely abated. The patient could swallow without distress for the first time since his illness began. On the next day the temperature was normal and all complaints had disappeared.

---

*These patients were treated at the Philadelphia General Hospital and in the Medical Department of [illegible] Corporation, Wilmington, Delaware.

Case 6.—A 25-year-old white woman complained chiefly of sore throat and earache of two days' duration. The temperature was 100.1 F. Examination revealed marked injection of the right side of the pharynx and edema of the opening of the eustachian tube. PVP-iodine was applied to the pharynx by means of a swab. After thirty minutes the patient's complaints of pain had diminished. Reexamination showed that the eustachian tube was now open. The temperature had subsided to normal in four hours.

These cases are typical of the entire series. Of the 6 cases in which treatment was considered to have failed, there were long-standing fungous infections in 3. These, although considerably improved by PVP-iodine, did not clear up completely or recurred. In the other 3 cases there were bacterial infections treated late in their course, so that generalized therapy was also deemed necessary. The improvement in these cases could not be attributed wholly to local use of PVP-iodine, since penicillin was also given intramuscularly.

Series 2: PVP-Iodine Treatment of Wounds and Rise in Preoperative Cases. —Sixty-seven wounds of various sorts, from superficial skin cuts to deep muscular and tendon lacerations, were treated. In addition, in 34 surgical cases PVP-iodine was used as a cutaneous and incisional germicide. Typical cases are as follows:

Case 7.—A 28-year-old white man sustained a deep laceration of the left palm. The skin over the thenar eminence was completely undercut for approximately 2 cm., the tendons and subcutaneous structures being left exposed. The patient's hand was completely covered with grease and dirt, which was impossible to remove with soap and water. The entire hand was prepared with PVP-iodine. The patient complained of some burning when the PVP-iodine was applied directly into the deep laceration. For comparison, a small amount of alcohol was placed in one corner of the cut. The patient stated emphatically that the pain had increased considerably with the alcohol. The closure of the wound required 4 subcutaneous absorbable sutures, and 12 wire sutures were used to close the skin. In spite of the massed contamination present when the laceration occurred, recovery was uneventful, without any infection. The patient did show an elevation of temperature to a maximum of 100 F. twenty-four hours after the injury.

Case 8.—A 40-year-old white man was lifting a heavy box, which dropped on his right middle finger and amputated the distal phalanx. When first seen, the patient was bleeding profusely; his hands were completely covered with grease and dirt, which was impossible to remove with soap and water or thinner. After the bleeding had been controlled the entire hand was prepared with PVP-iodine. The patient complained of burning caused by the PVP-iodine on the raw surface of the finger. A drop of tincture of a mercurial was placed on the raw surface for comparison. The patient emphatically stated that the pain was much less intense with the PVP-iodine. His foreman in the meantime had retrieved the amputated fragment of finger. It was decided to attempt to graft the fragment, even though it had been lying on the floor for about fifteen minutes. The fragment was bathed for five minutes in a warm PVP-iodine solution. It was reapproximated by anchoring the bone ends by means of wire sutures and the skin ends with 10 wire sutures and a wire stay suture. The finger was splinted and bandaged. After five days the dressing was removed and the wound cleansed. It was without infection and in the process of knitting. The sutures were removed on the tenth day. At this time the distal third of the fragment had become dark and shriveled. The proximal two-thirds was somewhat swollen but viable. The shriveled fragment was removed and the skin edges reapproximated, with PVP-iodine used for antisepsis. Recovery was uneventful.

Case 9.—A 22-year-old white man had an infected sebaceous cyst behind the left ear. The skin was prepared with PVP-iodine. The cyst was incised, and purulent cheesy material was removed. A small drain soaked in PVP-iodine was inserted into the incision, and the wound was dressed. Twenty-four hours later the drain was removed. No evidence of infection was present. No irritation due to the PVP-iodine could be noted.

Case 10.—A 21-year-old white man had a ganglion on the dorsal aspect of the right wrist, which interfered with his work. The hair was shaved off and the skin prepared with PVP-iodine. A small incision was made over the ganglion; the tissues were separated, and a grape-sized ganglion was noted, arising from the extensor digitorum profundum tendon. The entire wound was coated with PVP-iodine after the ganglion had been excised. The skin was reapproximated with 2 nylon mattress sutures. The sutures were removed in six days. Recovery was uneventful.

Case 11.—A 40-year-old white man had had the left first upper molar removed and was complaining of pain. Examination revealed a dry socket. The socket was painted with PVP-iodine. Relief was apparent within thirty minutes. A second application of PVP-iodine was made at the end of four hours. No further treatment was necessary.

In addition to these two series, a number of patients with varicose ulcers were treated.

Case 12.—A white man aged 50 had stasis eczema and an infected varicose ulcer of the right ankle. The duration of the ulcer and the eczema was five years. The patient had undergone saphenous ligation and a variety of local treatment, without effect. PVP-iodine was given him to be applied locally night and morning, in addition to supportive dressings. The patient was seen at weekly intervals, and definite improvement was noted after the first week. Pain was diminished, and the seropurulent discharge cleared, the base of the ulcer showing healthy granulation tissue. After three weeks the ulcer was partially closed; there was no pain, and the stasis eczema subsided. Application of PVP-iodine was continued twice daily, and at the end of six weeks the ulcer was entirely healed. Epithelization being complete, the patient was discharged.

Case 13.—M. S., a white woman aged 50, had a varicose ulcer on the inner aspect of the left ankle, of four years' duration. Examination revealed marked varicosities. Superficial lesions and one dime-sized ulcer were present on the left ankle. Pain was present an
PVP-iodine was applied twice daily

supportive bandage. After one week the pain subsided and the ulcer was healing, being now only one-half its former size. The patient was classified as "improved."

Case 14.—M. S., a white woman aged 65, had a punched-out varicose ulcer the size of a split pea on the anterior aspect of the left leg. There was severe pain, with inflammatory changes. PVP-iodine was applied twice daily, with a supportive dressing. After one week the ulcer was healing and was half its original size. There was no drainage. The pain also had subsided. The patient was classed as "improved."

Case 15.—F. P., a white man aged 52, had had a dime-sized varicose ulcer on the posterior aspect of the right leg for four weeks. The pain was severe and was associated with stasis edema. PVP-iodine was applied twice daily. After one week the pain had diminished considerably. The ulcer was filling in, and epithelization was beginning. After two weeks there was no pain and the ulcer was almost healed. In addition to PVP-iodine, a supportive dressing was used. This patient also was classed as "improved."

A number of patients with thrush were also treated.

Case 16.—M. Z., a boy 5 weeks old, was seen in October 1950, with a condition of three weeks' duration, diagnosed as thrush. The area around the mouth was covered with plaques, and the tongue, buccal pouch and pharynx with heavy plaques. The child had been treated with gentian violet (1 per cent), boric acid solution, borax solution and antibiotics. Treatment with gentian violet caused excorciations. The baby would not eat or take the bottle. PVP-iodine was applied three times daily and produced dramatic results in twelve hours. The child began to eat well and was completely cured in forty-eight hours.

Case 17.—L. F., a woman aged 21, with a condition diagnosed as thrush, was seen in 1951. The lips and tongue were cracked and dry, with areas of plaques. The duration of the ailment was approximately nine months. It had been treated with antibiotics, gentian violet, vitamins and Dobell's solution. PVP-iodine was applied every four hours. An excellent response appeared in twenty-four hours. Within fort -eight hours most of the affected areas wer

A repo ral surgeon who treated

15 patients with conditions clinically diagnosed as thrush and fungous infection under dentures stated that in all cases there was a favorable response to PVP-iodine therapy, usually within a few days.

SUMMARY AND CONCLUSIONS

The chemical, physiologic and pharmaceutical aspects, as well as the uses, of polyvinylpyrrolidone (povidone) have been presented, together with the toxicologic and therapeutic evaluation of PVP-iodine as compared with Lugol's solution and tincture of iodine. These studies show that the toxicity of PVP-iodine is much less than that of iodine in the tincture or in Lugol's solution.

Clinical studies show that PVP-iodine is safe and effective in the treatment of a variety of infections of the skin and mucosa. It has been found effective in the treatment of thrush. With PVP-iodine the germicidal action of the iodine is prolonged and the danger of cutaneous irritation, sensitization, reactions and burns is minimized.

Whereas tincture of iodine presents a hazard on accidental ingestion, PVP-iodine presents no such danger, because it is only from one-fourth to one-ninth as toxic. PVP-iodine presents iodine in a form of low toxicity but of high germicidal action. It has been found valuable in the treatment of a variety of skin and mucosal infections produced by many different types of bacteria.

REFERENCES

1. Hecht, G., and Wesse, H.: Munch. Med. Wchnschr. 90:11-15, 1943. Reppe, W.; Schuster, C., and Hartmann, A. (assigned to I. G. Farben): German Patents 737,663 and 738,753 filed Jan. 17, 1939.

2. Schulz, E.: Deutsch. Med. Wchnschr. 67: 779-784, 7-18, 1941. Tonnis, W.: Neurochirurgie 3:113-161, 1941. Orator, V.: Leitfaden der Feldchirurgie in Bewegungskrieg (pamphlet). Leipzig: J. A. Barth, 1942. Tonnis, W.: Behandlung der Schussverletzungen (pamphlet). Berlin-Munich: J. F. Lehmann, 1942.

3. Wesse, H.: Pharmazie 3:337-340, 1948.

4. Bennhold, H., and Schubert, R.: Ztschr. ges. exper. Med. 113:722-736, 1943. Schubert, R.: Ztschr. ges. exper. Med. 114:634-635, 1945; Artzl. Forsch. 3:425-428, 1949.

5. Bennhold, H.; Ott, H., and Weich, M.: Deutsch. med. Wchnschr. 75:11-15, 1950. Schubert, R., and Wiegandt, E.: Klin. Wchnschr. 24 and 25:273-276, 1947.

6. Duttmann, G.: Zentslbl. f. Chir. 68:530-535, 1941.

7. Schubert, R.: Artzl. Forsch. 3:425-428, 1949. Deutsch. med. Wchnschr. 43 and 44:551-553, 1946. Rev. Gastroenterol. 17:165-179, 1950.

8. Cantor, A., and Shelanski, H. A.: Soap and Sanitary Chemicals, February, 1951. Further Considerations of Germicidal Capacity Testing, pamphlet, 1952.

9. Shelanski, H. A., and Shelanski, M. V.: A New Technique of Human Patch Tests, Proc. Soc. Sect. T.G.A. 19, 1953.

Hilarity and good humor, a breezy cheerfulness, a nature "sloping towards the southern side," as Lowell has it, help enormously both in the study and in the practice of medicine.

The physician needs a clear head and a kind heart.

Avoid wine and women—choose a freckle-faced girl for a wife; they are invariably more amiable.

—*Osler*

Genitourinary Surgery

Pathogenesis and Treatment of the Idiopathic or Primary Hydronephroses

A. A. MacKELVIE, M.D., F.R.C.S. (Edin.), F.I.C.S.*
ALLOA, SCOTLAND

If one excludes from consideration those cases of hydronephrosis of obvious cause, e.g., stone, ureteric stricture or *extrinsic pressure on the ureter, there re*mains a group of cases in which the hydronephrosis is limited to change above the pyeloureteric juncture and there is no obvious associated ureteric alteration. This is the idiopathic or primary type.

There are several theories as to the cause of this primary type of hydronephrosis. None of them appears to offer adequate explanation. The purpose of this article is to review the current knowledge and advance a theory of pathogenesis from which is derived the appropriate treatment of the disease.

Material.—I have reviewed all the cases of primary hydronephrosis I have encountered in the past six years and, since it is essential to my thesis, the cases of nephroptosis without hydronephrosis observed in the same period. Since, broadly, all the urologic disturbances of all age groups in this area come to my service, the cases should reflect with reasonable accuracy the true incidence of the condition in the population seeking treatment.

I have divided the cases into three groups: *In Group 1, in which the hydro*nephrosis was associated with a vascular abnormality (either an aberrant renal vessel or an abnormal lower polar artery), there are 38 cases; in Group 2, in which hydronephrosis was associated not with *any vascular abnormality but with neph*roptosis, 22 cases; in Group 3, in which nephroptosis but neither vascular abnormality nor hydronephrosis was present, 38 cases.

The chart (*A*) and Table 1 show the precentage incidence for each decade in each group. The maximum incidence in each group occurs in the age period from 20 to 50 years. Each group has a peak incidence in the 30-40 decade. Except in Group 1, which includes 1 patient aged 8, there is no incidence in the first decade of life. The incidence of hydronephrosis is evident earlier in Group 1 than in Group 2.

Sex and side incidence are shown in Table 2. In Groups 2 and 3 the sex and side incidence are similar; the female and the right side are preponderant. In Group 1, though predominance of the incidence of the female over the male is considerable, the right-sided preponderance is not so marked. Even if the male and female patients in Group 1 are considered separately, the right-sided predominance is no longer so striking. Bilateral incidence is more evident in Group 1.

Table 1 shows also the infection rate for the three groups as estimated by culture of the urine when the patient was first seen. Infection was commonest in Group 1 and least common in Group 3.

If the *range of degree of hydronephro-*

---

*Consulting Surgeon and Urologist, Stirling Royal Infirmary, and Stirling and Clackmannan Hospitals; Consulting Urologist, Falkirk and District Royal Infirmary.

Submitted for publication April 4, 1956.

sis observed is estimated from 1 to 10, with 1 representing early pyelectasia and 10 the huge functionless hydronephrosis, or pyonephrosis, and the degree of hydronephrosis is then plotted against the patients' ages, *B* (see chart) results. This shows that the degree of change is considerably less in Group 2 than in Group 1. At no age does severe hydronephrosis occur with ptosis only; with associated vascular abnormality, severe hydronephrosis may occur at any age.

Present Theories.—On the basis of the foregoing facts, one may now review the six conventional theories advanced to explain the origin of primary hydronephrosis. They may be called the infection theory, the neuromuscular imbalance theory, the adhesions theory, the congenital valve theory, the aberrant vessel theory and the renal unfolding theory.

The infection theory is associated mainly with the writings of Winsbury White.[1] His theory is that after infection there is ureteritis, causing first dilation and lengthening of the ureter and later contraction and stenosis, which lead to incompetence of the ureter to pass the normal volume of urine. Back pressure and hydronephrosis result. Other changes may follow, but the ureteral change is the primary lesion.

In all my cases a ureter of normal caliber was observed on roentgen examination and at operation. When it has been possible to obtain portions of the ureter from patients coming to nephrectomy, no pathologic change has been observed in the ureter that could obstruct the outflow of urine. If the primary lesion was ureteritis, it would be reasonable to expect ureteral stricture at varying levels of the ureter; I have not observed this in any case. Maitland[2] has shown that a hydronephrotic kidney may secrete a larger volume of urine than does its normal fellow; the ureter, then, is actually transporting a volume of urine greater than the normal.

A study of my cases shows that, when hydronephrosis has developed, it is not infrequently associated with infection. It is impossible to state whether the infection preceded or succeeded the hydronephrosis. Infection, however, is frequently absent in the early stages. At the time of the first examination, 60 per cent of the patients in Group 1 and 81 per cent of those in Group 2 showed sterile urine on culture. It is a urologic commonplace that obstruction to outflow is frequently complicated by infection, but it is fallacious to reason that, because infection complicates retention owing to prostatic enlargement, infection necessarily preceded and caused the prostatic adenoma and the enlarged bladder.

That the condition is related to pregnancy, during which urinary infection is more common than usual, is also suggested by Winsbury White. In my series, only 11 of 25 patients in Group 1 and 11 of 19 in Group 2 were parous (50 per cent).

In my experience, urinary infection is commoner in the older patients of both sexes. One would therefore not expect the maximal incidence in the age groups shown.

Finally, if one accepts the theory that ureteral changes are the primary etiologic factor, then clearly any operation that does not deal with the ureteric incompetence must fail to relieve the condition. In practice this has not been confirmed, and there is adequate evidence of retrogression of hydronephrosis after operations that did not alter the ureter in any way. For all these reasons, I cannot accept the infection theory.

The most valuable contribution of the article cited is the conception that backward extension of the increasing renal pelvis is impossible because of the unyielding structures posterior to the kidney and that, therefore, forward extension alone is possible; this may lead to herniation of the pelvis between branches of the vascular pedicle, with increasing mechanical obstruction and increasing hydronephrosis. Winsbury White denies the role of the aberrant renal artery as a causal factor, showing that, with the herniation process, what has commonly been considered an aberrant vessel is in reality the normal lower polar vessel, which, because of the forward herniation process and downward extension of the pelvic sac, has come to lie behind the dilated pelvis. That aberrant vessels do occur is undeniable; I have observed them arising directly from the aorta and entering the lower pole outside the hilum. At operation these may have an apparent posterior relation to the pelvis, but there is no proof that this relation existed before the hydronephrosis developed. In my own opinion, a large number of so-called aberrant vessels are normal lower polar vessels.

The neuromuscular theory[3] is that neuromuscular imbalance is present, affecting the pelviureteral sphincter and leading to obstruction to the outflow of urine from the pelvis and the development of hydronephrosis. This theory is not acceptable to me, because it seems not to explain satisfactorily the predominant right-sided incidence. It seems unreasonable that one of two paired organs should suffer so markedly. Again, one who accepted this theory would expect that such lesions as hydrocalicosis, with or without associated hydronephrosis would occur with any local neuromuscular upset from imbalance of sphincters other than the pelviureteral. This I have not encountered. If the condition is analogous to such a lesion as the common pyloric stenosis of infants, some pathologic change in the pelviureteral sphincter should be visible. I have examined this sphincter in all cases at operation and in as many cases as possible in specimens, and have not observed variation from normal. This theory offers no reasons for the sex and age incidence.

Several varieties of adhesions in the area of the pelviureteral juncture, causing kinking at this site with obstruction to outflow, have been described. It is undeniable that these can at times be demonstrated, but I have succeeded in defining a lesion of this type in only a few cases. No doubt, where hydronephrosis has arisen and especially where infection has supervened, these adhesions can frequently be demonstrated, but their presence is not proof that they were the original cause of the process, and their frequent absence disproves their causal significance.

The presence of congenital valves at the pelviureteral juncture has been postulated as a cause.[4] I have found no evidence of these either in sections of the area in nephrectomy specimens, or, as we have done in some cases, by passing small sounds from a pelvic incision down through the pelviureteral junction. If a congenital lesion were present we think the age incidence, the sex incidence and the affected side incidence would not be as found in our experience. We therefore reject this explanation.

The aberrant vessel theory[5] is that the cause initiating the hydronephrosis is either an aberrant vessel or an abnormal lower polar vessel which by pressure on the area of the pelviureteral junction causes obstruction leading to hydronephrosis.

Where there is an abnormal vascular finding the most striking feature of that case has been that the marked change from normal ureter to abnormal hydronephrotic pelvis occurs exactly and always exactly where the abnormal vessel crosses. In nephrectomy specimens of advanced cases where renal destruction and pyonephrosis has occurred it is difficult to demonstrate that an abnormal vessel is [illegible] owing to the dense fibrosis in the area, to the distortion of relationships in the specimen because of the operation and to the detachment of the abnormal vessel from its aberrant origin during nephrectomy: usually by patient search and dissection it is possible to demonstrate that some vascular abnormality was present.

If the sole cause of the hydronephrosis were an aberrant vessel or an abnormal lower polar vessel then one would expect the maximal age incidence would be in early years since the vascular abnormality had been present since birth. We do not find this. If the aberrant vessel is in reality a normal lower polar vessel in abnormal posterior relationship to the pelvis as suggested by Winsbury White it could not by itself have caused the hydronephrosis which produced the abnormal relationship.

In what I have called the renal unfolding theory, Hamilton Stewart[6] suggested that the primary cause of the hydronephrosis associated with vascular abnormality is pressure, either from an aberrant vessel or a normal lower polar vessel, the pressure being caused by the pull on the vessel as the folded, "hairpin" shape of the kidney alters to the adult reniform shape during growth. This unfolding separates the poles of the kidney, drags the normal lower polar or aberrant artery across at the pelviureteral juncture, produces obstruction and so causes hydronephrosis. The difficulty in accepting this theory wholly is that the unfolding process is well advanced by the age of 2½ and probably complete by the age of 4½ years.[7] It affects both kidneys. One would expect an early age incidence and an equal incidence as to side and sex. Tables 1 and 2 do show that there is a shift in Group 1 from the predominant right-sided incidence to a more nearly equal side incidence, as well as a more nearly equal sex incidence and an earlier age incidence—with the peak incidence, however, in the same field as in Groups 2 and 3. That an abnormal vascular relation is not the sole cause is agreed by Hamilton Stewart, whose observation I can corroborate when he states that "a linear filling defect can often be seen in routine pyelograms indicating the presence of an aberrant artery"; and "it is clear that, therefore, in order that a lower polar artery shall cause obstruction an additional factor or facts must be present." This theory of Hamilton Stewart is nevertheless most attractive, if for no other reason than that it has led him to his valuable operation for vascular pressure hydronephrosis, which restores the fetal renal shape. Yet it fails to explain 22 out of 60 cases in which no vascular abnormality was present.

Theory Advanced. — These considerations have led me to search for some other

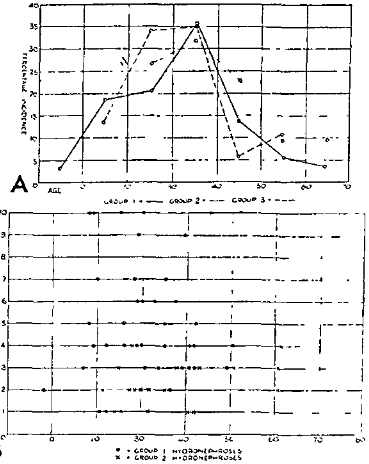
TABLE 1.—*Age Incidence*

	0 - 9	10 - 19	20 - 29	30 - 39	40 - 49	50 - 59	60 - 69	*Infection Rates* F	M
Group 1	1 3%	7 18%	8 21%	14 36%	5 13%	2 6%	1 3%	11 44%	4 30%
								40%	
Group 2			6 27%	7 32%	5 23%	2 9%	2 9%	3 15%	1 50%
								18%	
Group 3		5 13%	13 34%	14 35%	2 6%	4 12%		2 5%	
								5%	

cause initiating the changes. In my opinion, the role of nephroptosis has been overlooked and has definite importance.

On a reviewing of my cases (Table 1 and Fig. 1) there appears a striking correspondence in age, sex and side incidence in Groups 2 and 3. Kelly and Burnam stated that the right kidney is mobile twelve to twenty times oftener than the left, with a female incidence of 22.8 per cent against a male incidence of 2.1 per cent. Their data on age incidence are similar to what I have shown in Groups 2 and 3. W. K. Irwin[8] *gave the incidence of* ptosis as 10 female to 1 male, 7 right-sided to 1 left-sided and 25 to 40 as the period of age incidence. I am convinced that this right-sided ptosis, commonest in women, is an important factor in the production of Group 2 hydronephrosis.

Not *all* patients with ptosis, however, have hydronephrosis. In my opinion the particular vascular arrangement present decides whether or not hydronephrosis will develop. If the degree of ptosis is such that when the kidney descends and rotates the vessels become taut and obstruct outflow by pressure at the pelviureteral juncture, then hydronephrosis will develop. Tuffier[9] has shown experimentally that angulation of the ureter over a thread, producing incomplete obstruction—"variété correspondante à l'hydronéphrose par rien mobile"—causes increasing hydronephrosis. Where there is an aberrant vessel or an abnormal lower polar vessel the danger of obstruction is greater. I have noted that the patients in Group 1 show a degree of ptosis of the affected kidney except in those cases in which a massive, fixed hydronephrosis or pyonephrosis clearly could show no mobility, because of its bulk or its fixation from inflammatory changes in the renal pouch. I have, therefore, come to view hydronephrosis in [illegible] idiopathic or primary groups as [illegible] renal ptosis, with which there may or



A, incidence by percentage; *B*, extent of hydronephroses.

not be associated a vascular abnormality.

When there is no vascular abnormality the ptosis may lead to pyelectasia and hydronephrosis if, as the kidney descends and rotates on becoming ptotic, the pelviureteral juncture is partially obstructed by the taut vascular pedicle on which the kidney swings as it descends. Unless there is a vascular abnormality, the condition seldom progresses beyond a mild degree of hydronephrosis. When vascular abnormality is associated with the ptosis, either *in the form of an early split of the renal* artery or in that of a truly aberrant renal vessel going to the lower pole of the kidney, then further progression of the change, due to pressure of this abnormal vessel when the kidney is ptosed, is possible. Once the change has progressed to the stage at which herniation of the pelvis through the vascular loop occurs or fixation of the increased pelvis over the ab- [illegible] l vessel [illegible] the condition inevi- [illegible] ntual gross hydronephrosis; loss of function, infection and pyonephrosis follow. When there is a true aberrant vessel arising directly from the aorta and crossing anterior to the ureter to enter the lower pole of the kidney outside the hilum, as it sometimes does, the danger of pressure is obviously greater, and severe changes may arise, with a small degree of renal mobility. It is the interaction of the degree of ptosis with the particular vascular abnormality present, both variables, which produces the variations in end results from pyelectasia to gross hydronephrosis.

One would expect, if this theory is correct, that there would be some relation in sex, side and age incidence between ptosis alone and primary hydronephrosis. Tables 1 and 2 show a clear correlation between Groups 2 and 3. The altered incidence in Group 1 is probably explicable by the fact that here the vascular abnormality is relatively the more important etiologic factor. Even in Group 1 the peak age incidence corresponds with that in Groups 2 and 3, suggesting that a common factor —ptosis—is operating. It is suggested that the slight lag in age incidence of Group 2 behind Group 3 is due to the fact that ptosis comes first and the hydronephrosis takes some time to develop. It must be remembered that when ptosis is the main productive factor it is nonoperative for about one-third of each day, when the patient is recumbent. It is possible that this factor and the absence of marked vascular abnormality explain the lesser severity of the hydronephrosis in Group 2.

The development of the hydronephrotic change is slow. Careful history taking often reveals minimal symptoms for years before the patient seeks advice. It is interesting to note that, of the patients in Group 1, 5 had undergone appendectomy elsewhere for "chronic appendicitis." In Group 2, 2 had been appendectomized, and in Group 3, 10 had undergone previous appendectomy and 3 cholecystectomy without relief of their symptoms. This suggests that right-sided abdominal symptoms had been present for some time before the patients consulted me. If it is correct that development is slow, it is probable that the anatomic changes of developed hydronephrosis are permanent, and relief of the obstruction will not produce return to normal contours.

The differential diagnosis is necessarily radiologic. It is essential, in all cases in which there is any degree of hydronephrosis, to take at least one plate with the patient erect. When vascular obstruction is present the typical "bowler hat" shape is present in the pelvis, the smooth flow of the curve of the lowest calicine border and pelvis round to ureter is altered to an angulation where the vessel pulls the pelviureteral juncture upward. This is usually more pronounced in the erect plate. There is commonly delay in emptying of the pelvis.

If assessment of function of the affected kidney by excretion pyelographic study is not possible, further functional studies by chromocystoscopic investigation or separation of the urine from each side by ureteric catheterization should be done. It is essential to conserve any kidney that functions reasonably well, since adequate treatment may result in improvement of function.

Treatment.—This conception of the pathogenesis of hydronephrosis is a guide to the proper treatment. When one is confronted with ptosis and pyelectasia and no demonstrable abnormal vascular pattern, it is sufficient to do a simple nephropexy. Struck by the dense fixation of the kidney on which any previous operation had been performed — any renal operation, in my opinion, fixes the kidney—I have given up all previous types of nephropexy and use the following simple procedure. I expose the kidney, make certain that no adhesions

TABLE 2.—*Sex and Side Incidence*

		Female Patients	*Male Patients*	*Right Side*	*Left Side*	*Bilateral*	*Female Patients*			*Male Patients*			*Female Patients Taking Maximal Side Incidence*			*Male Patients Taking Maximal Side Incidence*		
							R	*L*	*B*	*R*	*L*	*B*	*R*	*L*	*B*	*R*	*L*	*B*
Group 1		25	13	21	9	8	14	6	5	7	3	3	17	8		7	5	1
Aberrant vessel group	38	66%	34%	55%	24%	21%												
Group 2		20	2	21	1	0	21				1		21				1	
Ptosis and Hydronephrosis	22	91%	9%	95%	5%													
Group 3		37	1	37		1	36		1	1			37				1	
Ptosis only	38	97%	3%	97%		3%												
	98																	

TABLE 3.—*Operations*

	Nephrectomy	*Arteriotomy*	*Arteriotomy and Partial Nephrectomy*	*Fetalization*	*Nephropexy*	*Nephropexy and Neurectomy*	*Nephropexy and Plastic Operation*
Group 1	4 (1 death)	13 (In 1 patient stone developed later, probably from large renal infarct; partial nephrectomy should have been done)	2	6	2	1	
Group 2	2				14	5	1
Group 3					33	5	

Apart from 1 death, results have been good in all cases. The patient who died had bilateral aberrant vessels with a large right hydronephrosis and a huge left pyenephrosis. She was transferred to me with uremia and cardiac failure and died of cardiac failure after left nephrectomy.

are present to kink or block the upper part of the ureter or the pelviureteral area, remove the perirenal fat and replace the kidney in the renal pouch, which has been swabbed with iodine. If the patient is nursed with the foot of the bed raised for seven to ten days, the kidney will adhere in its correct position and remain fixed there. It is my practice to do this simple form of nephropexy—which postoperative and follow-up pyelograms have proved adequate—through a muscle-splitting incision in the loin, an incision I prefer to any of the muscle-cutting incisions when a wide exposure is not required. If renal pain has been a marked feature in the history I favor renal denervation in addition.

When the condition present is early hydronephrosis with vascular pressure from the lower polar component of an early splitting normal renal artery, simple nephropexy is considered adequate if herniation has not occurred. The pelvis, the pelviureteral juncture and the upper portion of the ureter are freed from any adhesions, and, if it is clear that when the kidney is replaced no pressure on the urinary channel can occur from the vessel, simple nephropexy is all that is required. Occasionally, when there has appeared doubt of adequate removal of the vessel from the pressure area, I have looped a catgut band loosely around the entire vascular pedicle to gather it together and, by altering the line of the offending vessel, remove it from the danger point.

When herniation has occurred, something further than nephropexy is desirable. The choice then lies between division of the vessel, with or without lower polar partial nephrectomy, and the operation described by Hamilton Stewart, in which, by means of a catgut hoop around the kidney, the lower and upper poles are approximated, the fetal shape of the kidney restored and (the crux of the operation) the line of the vessels thus so altered as to remove them from the site where they can press on and obstruct the pelviureteral juncture. When the vessel is a branch of the renal artery I have observed that, unless there is a considerable degree of hydronephrosis to allow easy molding of the kidney, the renal substance is not adequately elastic for easy approximation of the poles. I then divide the artery, with or without polar nephrectomy. When considerable hydronephrosis is present I find Stewart's operation a most valuable procedure. One can by its use conserve the entire function of the kidney and prevent further damage to it. In the type of case in which the abnormal vessel is truly aberrant and arises directly from the aorta I section the vessel, and, if the subsequent renal infarction appears large enough to deserve it, I resect the infarcted area.

When the kidney has become functionless or practically so and pyonephrosis is present, there is no choice and nephrectomy is required.

It should be remembered that, in all the conservative operations, nephropexy has been automatically performed by the necessary operative manipulations. The patient should therefore be nursed flat, with the foot of the bed raised 9 inches (22.5 cm.) to allow the normal renal position to be maintained long enough for adequate fixation to occur.

I have seldom found it necessary or desirable to add any type of plastic procedure on the pelvis. If the ureter issues at the lowest point of the pelvis with the kidney *in situ*, nothing further is done. If pyeloplasty is required, I remove an adequate "diamond" from the pelvis posteriorly and close the edges of the gap, taking care not to encroach on the pyeloureteral juncture. Before closing the pelvic wound I pass either a large double channel ureteric catheter or a polythene tube of suitable diameter down the ureter into the bladder. This is removed after a week by forceps through an operating cystoscope. I do not favor drainage of the pelvis by a large de Pezzer or similar tube thrust through the renal substance and led out through the wound. If neat pelvic suturing is done there should be no need for drainage; renal damage, possible hemorrhage and, almost inevitably, infection are the concomitants of transrenal drainage.

If the condition is an early one and the obstruction is adequately overcome, one can expect some diminution or even disappearance of the hydronephrosis after the operation; but, since in my opinion the hydronephrosis has developed slowly and there is little natural tendency for regression of fixed changes, I do not look for dramatic physical alteration in the hydronephrosis. Conservation of function by removal of the cause of the progressive hydronephrosis is considered more important than a return to anatomic normality.

Table 3 shows the operations I have performed in these cases and the results.

SUMMARY

1. Reasons are given for discarding earlier theories of the causation of primary hydronephrosis.

2. A new statement of the cause of the condition is offered.

3. The treatment of the condition is set out and results given.

Author's Note: I am indebted for helpful criticism and advice in preparing this article to Mr. W. B. G. Angus, O.B.E., M.C., M.A., M.B., F.R.C.S. Ed., and Dr. D. M. Harper, M.A., M.B., D.M.R. Eng.; to Dr. Harper's department for all the radiologic work; and to Dr. Rankin for the *pathologic examinations.*

RÉSUMÉ

1. Des raisons sont énumérées pertettant d'abandonner certaines théories dépassées concernant l'origine de l'hydronéphrose primaire.

2. Une nouvelle cause de cette affection est proposée.

3. Traitement et résultats.

ZUSAMMENFASSUNG

1. Es werden Gründe angegeben, die zur Aufgabe früherer Theorien über die Ursache der primären Hydronephrose veranlassen.

2. Es wird eine neue Erklärung der Ursache der Erkrankung vorgeschlagen.

3. Die Behandlung der Erkrankung und die Ergebnisse werden beschrieben.

RIASSUNTO

1. Vengono dimostrate le ragioni per cui si devono scartare alcune vecchie teorie sulla genesi dell'idronefrosi.

2. Viene suggerita una nuova ipotesi.

3. Vengono stabiliti i metodi di cura dell'affezione e comunicati i risultati.

SUMARIO

1. O autor apresenta razões para o afastamento de teorias antigas da causa de hidronefrose primária.

2. Uma nova afirmação para a causa dessa condição é oferecida.

3. O tratamento dessa condição é dado e os resultados apresentados.

REFERENCES

1. Winsbury-White, H. P.: The Pathology of *Hydronephrosis, Brit. J. Surg.* 13:50, 247-281, 1925.
2. Maitland, A. I. L.: Function in the Hydronephrotic Kidney, Brit. J. Urol. 21:334-340, 1949.
3. Hosford, J. P.: Lancet 1:435-441, 1932.
4. Boyd, W.: Surgical Pathology. Philadelphia and London: The W. B. Saunders Company, 1947, p. 397.
5. Roche, A. E.: The British Encyclopaedia of Medical Practice. London: Butterworth & Co. (Publishers), Ltd., 1938, pp. 390-393.
6. Stewart, H.: A New Operation for the Treatment of Hydronephrosis in Association with a Lower Polar (or Aberrant) Artery, Brit. J. Surg. 35:137, 51-57, 1947.
7. Kelly, H. A., and Burnam, C. F.: Disease of the Kidneys, Ureters and Bladder. New York: D. *Appleton-Century Co., 1914, vol. 1, p. 125.*
8. Irwin, W. K.: In Winsbury-White, H. P. (Editor): Textbook of Genito-Urinary Surgery. Edinburgh: G. and S. Livingstone Ltd., 1948, p. 62.
9. Tuffier, T.: Bul. Soc. Anat. Paris 68:435-436, 1893.

Renal Responses to Remote Surgical Manipulations in the Dog

SYDNEY M. FRIEDMAN, M.D., Ph.D.,* ROWLAND W. RADCLIFFE, M.D.,
M.Sc.,** J. E. H. TURPIN,† AND CONSTANCE L. FRIEDMAN, Ph.D.‡

VANCOUVER, B. C., CANADA

WE have recently reported that a period of functional vasoconstriction persists beyond the period of clamping the renal artery in the dog.[1] This functional vasoconstriction is often sufficiently intense to keep the dog oliguric or anuric for several additional hours after release of the clamp. In a further study[2] we have demonstrated that remote nociceptive stimuli are also capable of producing distinct renal vasoconstrictive changes. The segment of the vascular system lying between the renal pedicle and the femoral triangle appears to be a major "trigger area" for the renal effects. In the mildest instances the renal response is limited to a temporary decline in renal plasma flow; in the most severe instances manipulation frequently leads to complete anuria. We have since been able to produce anuria by deliberate manipulations in some, but not all, instances. It is reasonable to infer that the observed changes form a pattern of graded ischemic response that may have direct bearing on the problem of traumatic anuria. The present report is concerned with our studies of the actual "trigger areas" which, on manipulation, produce renal vasoconstrictive effects.

Mongrel dogs of both sexes weighing not less than 13 Kg. were used. Intravenous nembutal (30 mg. per kilogram) was used as anesthetic, with a free airway insured by endotracheal intubation. Renal function was studied by standard clearance technics with creatinine and sodium para-aminohippurate.[3] Infusions were given into the left saphenous vein, and urine was collected by direct ureteral catheterization from the separate kidneys. Continual check on the blood pressure was made with a Sanborn electromanometer coupled to an 18-gauge needle in the left femoral artery. Three basal twenty-minute clearance periods preceded further manipulations. Succeeding twenty-minute clearance periods were observed continuously except for a few brief interruptions for technical reasons.

Trauma was confined to the right femoral vein in 3 dogs. In Dog 1 the right femoral vein was merely exposed and clamped for five minutes. This produced no change in renal function. In Dog 2 the vein was tapped with a scalpel handle for two minutes over a one-inch segment. The output of urine fell immediately from 3.1 to 2.7 cc. per minute on the left and from 2.9 to 2.2 cc. per minute on the right through the following twenty minutes with no changes in C_{cr} or C_{PAH}. In Dog 3, a 2-inch (5 cm.), segment of balloon catheter was inserted and tied into the vein so that blood flow was not further obstructed except during the brief period required for the operation. Insertion of this catheter was accompanied by a marked fall in urine output and C_{PAH} of both kidneys illustration, *a*) without change in C_{cr}. This was

---

*Professor and Head, Department of Anatomy, University of British Columbia, Vancouver.

**Teaching Fellow, Department of Anatomy.

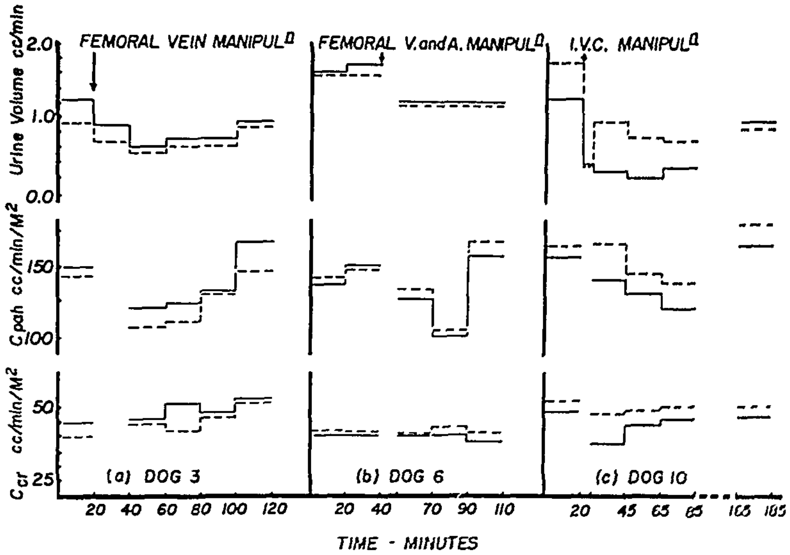
†Research Assistant, Department of Anatomy.

‡Research Associate Professor, Department of Anatomy.

From the Department of Anatomy, University of British Columbia, Vancouver, British Columbia, Canada.

Research carried out under Defense Research Board Grant 9310-45, Project No. D50-93-10-45.

Submitted for publication Feb. 1, 1956.



The effect of manipulation on function of separate kidneys. *Right,* solid line; *left,* dotted line. *a,* insertion of a catheter into the right femoral vein; *b,* direct trauma to right femoral artery and vein; *c,* application of a ligature around the inferior vena cava without constriction.

observed over three consecutive clearance periods. Full recovery occurred by the fifth period. At this time the balloon was inflated with 7 cc. of warm water. This was followed at once by a fall in urine output from 1.2 to 0.6 cc. per minute on the left and from 1.25 to 0.65 cc. per minute on the right. Recovery occurred in the fourth succeeding period. We conclude that renal effects frequently, but not always, follow manipulation of the femoral vein.

Trauma to the right femoral artery and vein was studied in 4 dogs. In Dog 4 these vessels were surgically dissected free, and no renal effect was noted. An identical procedure in Dog 5 was followed by an immediate but moderate decline in urine output (left, 2.7 to 2.1 cc. per minute; right, 2.3 to 1.9 cc. per minute), which persisted for three clearance periods. A slight drop in C[illegible] was noted (left, 116 to 105 cc./min./M²; right 122 to 101). Eighty minutes after dissection the vessels were picked up and tapped with a scalpel as aforedescribed. This was followed by a fall in urine output from 2.1 to 1.75 cc. per minute on each side. In Dog 6, exposure of the femoral vessels and trauma as aforedescribed were performed as a single procedure. The clear-cut renal effects are shown in the illustration (b). The same procedure was repeated, with similar results, in Dog 7. We conclude that renal effects are not [illegible] regularly observed [illegible] trauma to bot[illegible] [illegible] vessels than [illegible] the [illegible] alone. [illegible] later in 4 dogs. In Dogs 8 and 9 the balloon catheter was moved up from the right femoral vein to a position halfway between the bifurcation and the renal vein. In both dogs urine output and C_{PAH} dropped sharply, while C_{cr} remained unchanged. That this effect was not due to simple obstruction of the inferior vena cava was clearly shown in Dogs 10 and 11, in which the manipulation consisted in passing, but not tying, a ligature around the vein at the aforedescribed site. Marked changes in renal function followed immediately. These are shown in the illustration (*c*) for the animal showing the greatest change.

The renal pedicle was manipulated by surgical dissection of the renal vein and artery in Dogs 12 to 14. The manipulation produced a drop in urine output with a fall in C_{PAH}, while C_{cr} remained essentially unchanged. These effects occurred to some degree in all 3 dogs and were similar to those previously reported[2] as observed after a different type of manipulation of the renal pedicle.

It seems, therefore, that unilateral nociceptive stimuli from the vascular tree between the femoral triangle and the renal pedicle can produce bilateral renal vasoconstriction characterized by a fall in C_{PAH} and urine output. The actual manner of transmission of the stimulus has not been determined. Other work suggests that these same responses may be sufficiently intense to result in complete renal shutdown.[2]

SUMMARY

Segments of the vascular tree lying between the femoral triangle and the renal pedicle in the dog were subjected to mild trauma, after which the effect on function of the separate kidneys was observed. Simple manipulation of the femoral vein alone on one side frequently caused a bilateral renal response, while manipulation of both vein and artery more regularly invoked renal changes. The simplest renal effect consisted of a fall in the output of urine; a greater effect involved a reduction in the renal plasma flow as measured by C_{PAH}.

Similar but more pronounced changes followed manipulation of the inferior vena cava below the renal pedicle. The minimal trauma used consisted of simply passing a ligature around the vein without tying it. Surgical dissection of the renal pedicle was regularly followed by varying degrees of functional vasoconstriction of the kidney.

ZUSAMMENFASSUNG

Abschnitte des zwischen dem Oberschenkeldreieck und dem Nierenhilus liegenden Blutgefäss-Systems des Hundes wurden einem leichten Trauma ausgesetzt. Danach wurde der Einfluss auf die Funktion jeder der beiden Nieren beobachtet. Die einfache Manipulation der Femoralvene auf einer Seite ergab häufig eine Reaktion beider Nieren, während die Reizung der Vene und der Arterie mit grösserer Regelmässigkeit Nierenveränderungen hervorrief. Die einfachste Form der Wirkung auf die Nieren bestand in einem Sinken der Harnausscheidung; eine stärkere Wirkung bestand in einer Herabsetzung des Flusses des renalen Plasma, gemessen an C_{PAH}.

Ähnliche aber ausgesprochenere Veränderungen erfolgten nach Manipulation der unterven V. cava unterhalb des Nierenhilus. Die geringste Form der angewandten Reizung bestand in dem einfachen Anlegen einer Ligatur um die Vene, ohne sie abzubinden. Chirurgische Durchschneidung der Nierenwurzel rief regelmässig eine funktionelle Gefässverengerung der Niere verschiedenen Grades hervor.

RÉSUMÉ

Des segments de l'arbre vasculaire situé entre le triangle fémoral et le pédoncule

rénal du chien ont été soumis à un faible trauma, et l'effet sur la fonction de chaque rein séparément a ensuite été observé. Une simple manipulation de la veine fémorale d'un côté causait fréquemment une réponse rénale bilatérale; une manipulation des deux veines et de l'artère provoquait regulièrement des changements rénaux. L'effet rénal le plus simple consistait en une diminution du débit d'urine; une réaction plus grande impliquait une réduction dans l'écoulement du plasma rénal tel qu'il est mesuré par C_{PAH}. Des changements analogues *mais plus prononcés ont suivi* la manipulation de la vena cava inférieure, sous le pédoncule rénal. Le trauma minimal *utilisé consistait simplement à passer* une ligature autour de la veine, sans l'attacher. La dissection chirurgicale du pédoncule rénal était régulièrement suivie de degrés variables de vasoconstriction fonctionnelle du rein.

RIASSUNTO

Vennero portati dei traumi di media gravità sul tratto vascolare che va dal triangolo femorale al peduncolo renale, e quindi venne studiata separatamente la funzione dei due reni. La semplice manipolazione della vena femorale di un lato determina spesso effetti renali bilaterali; tali effetti sono costanti dopo manipolazione di entrambe le vene e delle arterie; essi consistono in una contrazione dell'eliminazione urinaria nei casi più semplici, mentre si può arrivare fino ad una diminuzione del flusso di plasma al rene.

Effetti analoghi si possono ottenere mediante manipolazioni della vena cava al di sotto del peduncolo renale, ma assai più pronunciati.

Il trauma minimo fu quello ottenuto col semplice passaggio di un laccio attorno alla vena, senza però legarla. La dissezione *chirurgica del peduncolo renale* determinò costantemente vasocostrizione di intensità varia.

REFERENCES

1. Friedman, S. M.; Johnson, R. L., and Friedman, C. L.: The Pattern of Recovery of Renal Function Following Renal Artery Occlusion in the Dog, Circ. Research 2:231-235, 1954.

2. Friedman, S. M.; Radcliffe, R. W.; Turpin, J. E. H., and Friedman, C. L.: "Reflex" Anuria in the Dog, Canad. J. Biochem. & Physiol. 34:159-169, 1950.

3. Phillips, R. A.; Dole, V. P.; Hamilton, P. N.; Emerson, K. Jr.; Archibald, R. M., and Van Slyke, D. D.: Effects of Acute Hemorrhagic and Traumatic Shock on Renal Functions of Dogs, Am. J. Physiol. 145:314-336, 1946.

* * *

Science since Darwin is fact upon fact, instance upon instance, experiment upon experiment, principle upon principle, which fitly joined together by some master mind may establish some great truth.

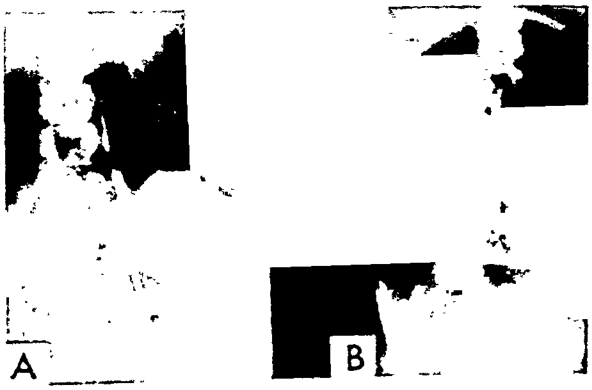
What I inveigh against is a cursed spirit of intolerance, conceived in distrust and bred in ignorance, that makes the mental attitude perennially antagonistic, even bitterly antagonistic, to everything foreign, that subordinates everywhere the race to the nation, forgetting the higher claims of human brotherhood.

—*Osler*

Complications of Surgery of the Genitourinary Tract

PARK NICELEY, M.D., F.I.C.S., F.A.C.S.
KNOXVILLE, TENNESSEE

EVER since the first nephrectomy was performed in 1869 for a uretero-abdominal fistula, urologic complications in the abdomen and pelvis have been the concern of surgeons. The incidence of these injuries continues in hospitals despite the great amount of attention called to them. On searching the literature, I observed to my dismay that most of the accidents occurred in operations performed by seasoned surgeons, not by interns and residents. From a discussion of this situation with other surgeons, it appears they do not take too kindly to the suggestion of placing catheters in the ureters prior to an extensive surgical procedure. Nevertheless, it has been noted by Sisk (cited by Moore) that routine use of catheters placed in the ureters prior to hysterectomy has practically precluded accidental ureteral injury.



A, ligation of lower third of right ureter after a complicated hysterectomy. *B*, ureterovaginal fistula resulting from supravaginal hysterectomy.

The ureters throughout their course are remarkably well protected from external trauma, so that injury of the ureter from external violence, except for penetrating wounds, is relatively rare. This is not true of the kidneys or the bladder, for they are not infrequently injured during accidents or by external violence. It has been estimated that the incidence of ureteral ligation as a complication of all operations on the female genital organs may be as much as 3 per cent. The relative ratio of unilateral to bilateral injury is presumed to be 6 to 1. The mortality rate today can hardly be compared to that which existed prior to the institution of various antibiotics, but the complications independent of infections still task the ingenuity of the surgeon and reemphasize the tremendous importance of all preventive measures. The gynecologist does not use roentgen rays in making a diagnosis of pathologic change in the pelvis. He depends on a history and physical examination, and the bimanual examination is not always accurate without anesthesia. He opens the pelvis and is not always aware of the presence of endometriosis, pelvic adhesions, intestinal adhesions or malignant tumor with its complications.

Ureteral injuries occur chiefly during radical hysterectomy for carcinoma of the cervix, but occasionally they occur during a simple supravaginal hysterectomy. The occurrence of these injuries, as well as vesical injuries, is secondary to such gynecologic operations as removal of large fibroids, ovarian cysts and tumors, tubo-ovarian inflammatory masses, endometri-

---

Read at the Mid-Atlantic Regional Meeting of the United States Section, International College of Surgeons, White Sulphur, West Virginia, March [illegible].

Submitted for publication April 17, [illegible].

osis and carcinoma of the cervix. Ureteral injuries have been known to occur after deep cauterization of the cervix, perineorrhaphy repair and vaginal hysterectomy.

Ligation of the ureter is the most common accident; next, crushing with clamps, incision or perforation with a needle, and, less common, excision. Slight contusion *may cause no symptoms except moderate* pain, tenderness and hematuria. A complete tear results in fistula, either into the vagina or becoming external to the surface through the abdominal wall. Great care should be taken not to traumatize the ureters with retractors or forceps or by pulling them forcibly aside.

Herman cites Wertheim as reporting that *anomalies in a series of* 500 radical hysterectomies resulted in damage to the ureter in 10 per cent. *One needs to be* mindful of anomalies of the ureters and the possible distortion and deviation of the ureters from their normal course caused by inflammation, tumors or cysts. Urograms taken prior to operation may be valuable in locating the course of the ureters. The surgeon is always cautious about the location of the bladder and repairs it if a rent is made, but he is never conscious that he is near the location of the ureters. After consulting with surgeons who have encountered the complication of ureteral *injury during operative procedure*, I have observed that in most instances the damage is caused by the *attempt to stop hemorrhage* by clamping the adjoining tissues with hemostats or by placing a tie around the vessels, consequently damaging or ligating the ureter.

The best time to repair a rent in the bladder or the ureter is during the operation. If consultation with the urologist is desired, it is advisable to wait until he arrives and repair the damage before closing the abdomen.

The *symptoms following genitourinary* injuries may be as follows: a fistula through the abdominal wound or through the vagina—possibly within the first twenty-four to forty-eight hours, although usually four to five days after the operation or even later—and chills and fever, often associated with pain in the abdomen. If both ureters are ligated, uremia results.

A urologic investigation should include, first, a careful history in relation to leakage of urine; and second, a vaginal exam*ination, bimanual and with the speculum*, to determine the location of the leak in the vagina. It may be a ureteral leak or it may be a vesical fistula. Intravenous injection of methylene blue and a careful cystoscopic examination and catheterization of the ureters may be necessary to locate the fistula. Careful bimanual vaginal examination should be made with special reference to tenderness in the renal fossae and also in the pelvis. Lastly, it is *imperative that the operation should be* done as soon as the patient's physical con*dition permits. Precautions should be* taken to preserve as much renal tissue as possible. Whenever the ureter can be transplanted into the bladder or into the sigmoid portion of the colon, it should certainly be done.

CONCLUSIONS

1. Ureteral injury is a fairly common surgical complication that is looked upon with horror by the gynecologist.

2. The most serious mistake is to open the ureter or the bladder unknowingly. Immediate repair of the damage often prevents serious complications.

3. Blind clamping of the tissues when severe hemorrhage occurs is to be condemned.

4. When complete anuria follows an extensive pelvic operation, occlusion of the ureters or bilateral nephrostomy *should* be performed rather than suppression of urine, which results *in the death of the* pati

SCHLUSSFOLGERUNGEN

1. Harnleiterverletzungen gehören zu den ziemlich häufigen chirurgischen Komplikationen, die den Gynäkologen ein Schrecken sind.

2. Der schwerste Fehler ist, den Harnleiter oder die Blase unwissentlich zu eröffnen. Sofortige Wiederherstellung des Schadens führt häufig zur Vermeidung ernster Komplikationen.

3. Die blinde Abklemmung von Gewebsteilen bei schwerer Blutung ist zu verurteilen.

4. Bei Eintritt völliger Harnverhaltung im Anschluss an umfangreiche Operationen im kleinen Becken sollte eine Unterbindung beider Harnleiter und eine doppelseitige Nierenfistel angelegt werden, anstatt die Harnausscheidung zu unterdrücken, was zum Tode des Kranken führen muss.

CONCLUSIONI

1. Le lesioni dell'uretere sono delle complicanze temibili in chirurgia ginecologica.

2. L'errore più comune è quello di aprire l'uretere o la vescica. La chiusura immediata può evitare gravi conseguenze.

3. Si deve assolutamente evitare l'emostasi alla cieca quando si è prodotta un'emorragia.

4. Un'anuria completa consecutiva ad un intervento pelvico è segno di legatura di entrambi gli ureteri e richiede la nefrostomia bilaterale.

CONCLUSIONS

1. La lésion urétérale est une complication chirurgicale assez courante; elle est considérée par les gynécologues comme un désastre.

2. L'erreur la plus grave consiste à percer (inconsciemment) l'uretère ou la vessie. La réparation immédiate de ce dommage évite souvent de sérieuses complications.

3. Le bridage aveugle en cas d'hémorragie grave est à condamner.

4. Lorsqu'une opération pelvienne importante est suivie d'anurie totale, une néphrostomie bilatérale est préférable à une anurie, car celle-ci à pour conséquence la mort du patient.

CONCLUSOES

1. A lesão ureteral é uma complicação cihúrgica bastante comum e que é encarada com horror pelo ginecologista.

2. O êrro mais grave consiste em abrir involuntàriamente o ureter ou a bexiga. O reparo imediato da lesão frequentemente impede graves complicações.

3. O pinçamento em massa dos tecidos quando ocorre severa hemorragia deve ser condenado.

4. Quando a anúria completa se segue a uma extensa operação pélvica, oclusão dos ureteres, deve ser feita a nefrostomia bilateral mais do que a supressão de urina, que resulta na morte do paciente.

BIBLIOGRAPHY

Beer, E.: Am. J. Obst. & Gynec. 33:1041-1049, 1937.

Castallo, M. A.: J.A.M.A. 133:244, 1947.

Davis, C. H.: Traumatic Injuries to the Urinary Tract. Hagerstown, Md.: The W. F. Prior Co., 1944, vol. 3, chap. 10, sect. 12, pp. 159-164, Gynecology and Obstetrics.

Dean, A. L. Jr.: Am. J. Obst. & Gynec. 25:667-674, 1933.

Eddy, R. W., and Miller, F. H.: Am. J. Obst. & Gynec. 33:85-90, 1937.

Herman, L.: Injuries of the Ureters. In The Practice of Urology. Philadelphia: The W. B. Saunders Company, 1938, vol. 1, pp. 352-369.

Howard, F. S.: J. Urol. 56:319-331, 1946.

McIver, R. B.: J.A.M.A. 124:1116-1120, 1944.

Moore, T. D.: J. Urol. 59:712-725, 1948.

Newell, Q. W.: Ann. Surg. 109:981-986, 1939.

Reaves, J. U.: J. Urol 57:65-72, 1947.

Sisk, I. R.: Surg., Gynec. & Obst. 60:857-860, 1939.

Neurologic Surgery

Lesions of the Central Nervous System Masquerading as General Surgical Lesions

H. LESTER REED, M.D., F.I.C.S.
LOUISVILLE, KENTUCKY

I SHOULD like to present a few examples of clinical states encountered by all physicians. Many have a somewhat obscure onset; the primary lesion being in the central nervous system with manifestations in a distant area, tending to mislead one in diagnosis. Most will be brief; none will be new, but I hope they will be helpful in recalling attention to these lesions, *which often at the outset defy diagnosis* and when fully developed permit a correct interpretation with little effort.

Intermittent nausea and vomiting, with or without headache or systemic symptoms, recurring over some months, associated with negative results from intestinal and abdominal examination, often occur, especially in children or young adults, as the first manifestation of brain tumor, particularly tumor of the midline or the posterior fossa. There is a "vomiting center" located in the brain stem, which may be stimulated in numerous mechanical or chemical ways. For example, an 8-year-old child was recently observed, who for six months had had episodic nausea and vomiting lasting one to three days without other associated signs or complaints and with total well-being at all other times. *On some occasions* there was low fever of short duration. Only after this rather long interval was one of the attacks associated with some headache and the development of mild incoordination and ataxia, directing attention to a tumor of the posterior fossa that had been present for some months.

"Wry neck," or neck stiffness of acute *onset and usually precipitous, often occurring* in stressful situations, is occasionally observed as the only manifestation of spontaneous subarachnoid hemorrhage. In numerous instances there is generalized headache, with some vomiting. The minimal bleeding lesions are most apt to pass *unrecognized. There is some rigidity of* the neck, usually without complaints referable to the extremities, but often with low backache, apparently due to meningeal irritation. The temperature is often normal. A spinal puncture often establishes a diagnosis. If this is made within *one or two days after the onset of complaints*, there is uniform distribution of fresh blood in the fluid. If the puncture is made after four or five days, yellow spinal fluid is present. Recognition of the first attack of bleeding may provide the patient his only opportunity [illegible]ival, as appropriate treatme[illegible] number of cases, is [illegible] demonstrates that

---

Read at the Mid-Atlantic Regional Meeting of the United States Section, International College of Surgeons, White Sulphur, West Virginia, Feb. 15, 1956.

Submitted for publication March 20, 1956.

bleed shortly, and with each such event the mortality rate climbs rapidly, so that few survive three or more such episodes. Cerebral angiographic study and surgical occlusion of the bleeding site, if feasible, are indicated.

Many chronic spinal lesions produce symptoms by irritation of a single nerve root and thus are manifested in pain, numbness, paresthesia, weakness or vasomotor change in the dermatome of that root. Because of dermatomic arrangements, as a consequence of developmental behavior, zones of root referral are quite predictable. Such distal complaints may direct one to the vertebral level of origin as a site of inquiry, even without local spinal symptoms.

Pain in the shoulder, the arm or the anterior and posterior aspects of the upper part of the chest, with cramps of the arm and forearm and finger paresthesias, with or without swelling of the hand, may occur alone or together as a result of a cervical root irritation, with little complaint referable to the neck. This can masquerade as bursitis, angina, myocitis, sprained shoulder or the shoulder-arm syndrome. When limitation of movement in the neck is a major symptom, the cause is more readily apparent; when it is not, this symptom can often be reproduced by deep palpation over the spinous processes or by compression or forceful rotation of the neck.

CASE 1 (*Herniation of Seventh Cervical Disc*).—A white woman aged 32, six months prior to operation, was attacked, while in bed, by sudden pain in the region of the scapula, with radiation to the forearm and thumb. Sneezing increased the complaints; the neck was stiff. There was severe progressive disability, with mild and incomplete remission. Cervical traction produced no relief. Subsequently there was pain in the axilla and through the left breast. The hand became discolored. The disability became total. A large cervical herniated disc was removed, and recovery was satisfactory. This syndrome can go on to produce bilateral signs, severe compression of the cord and paraplegia.

The boring or constricting type of thoracic pain, unilateral or bilateral, with intermittent or persistent nausea and at times without complaints referable to the back, often simulates angina, cardiospasm, pleurisy or an anxiety state, the real cause being irritation of a root at the dorsal level. All tests in the early stages, including critical investigation of the neural and spinal system, may and often do give normal results.

CASE 2 (*Benign Intradural Tumor at First Thoracic Level*).—A woman aged 50, two and one-half years prior to examination, had had recurrent interscapular pain of sudden onset. Relief was obtained by walking. To be in bed was especially painful. This state had continued relatively unchanged for over a year. For the past nine months there had been boring and squeezing pain in the left breast, radiating from the back through the chest and also to the left elbow. For six months numerous treatments had been given, including removal of teeth and tonsils, correction of anal fissures and the application of leeches. Hospitalization and bed rest were tried for five weeks, owing to the suspicion of coronary disease, though electrocardiograms were normal. Because of the atypical complaints, a spinal puncture was done; this also failed to reveal any abnormality. After the puncture, however, there developed dribbling of urine, and the lower extremities became weak and numb. The neck became stiff, and there appeared evidence of an incomplete spinal cord syndrome, with weakness of both lower extremities, a bilateral Babinski sign and vague sensory alteration. Removal of a meningioma at the first dorsal level brought recovery.

CASE 3 (*Hemangioma at Third Dorsal Level*).—A woman aged 44, when first seen, stated that for eighteen years she had felt pain under the right breast and abdominal cramps at intervals, gradually becoming more troublesome. Episodic nausea and interscapular pain occurred somewhat later. Fourteen years earlier cholecystectomy had been done, without improvement. Midline back pain in the low-dorsal area was added nine years prior to this examination, and uterine suspension followed by hysterectomy had failed to modify the symptoms. For two years fecal incontinence had been present at times, and various injections of procaine hydrochloride had failed to relieve these complaints. For twenty-three months the feet were numb and leg cramps were present. For three months, the legs became weak, and numbness gradually ascended to the abdomen. Tonsillectomy and leeches were ineffective. Roentgenograms demonstrated a hemangioma of the third dorsal vertebra, and there was gross compression of the cord. Laminectomy (though quite bloody and difficult), coupled with roentgen therapy, produced remarkable clinical improvement.

Cramps low in the chest or high in the abdomen, as well as pain radiating through or around the chest or the upper part of the abdomen, direct attention to the gallbladder, the pancreas, the upper part of the intestinal tract and the kidney, especially if equivocal laboratory data cause further suspicion of these viscera. This may lead to abdominal exploration without the discovery of any pathologic change.

CASE 4 (*Neurofibroma at Tenth Thoracic Level*).—For three years a woman aged 40 had had *intermittent pain in the lower portion* of the chest. Tiredness of the legs had been *present for one year; burning of the feet and* spasm of the calf, for seven months. For six *months there had been involuntary movement* of the legs in bed, and fecal urgency was apparent. For three months numbness of the legs, especially the right, was noted. For two months the knees would buckle and the patient would stagger. For one month there was numbness of the perineum. A large dumb-bell tumor (neurofibroma) was present, with an intrathoracic extrapleural mass and a smaller one within the spinal canal. Removal produced satisfactory clinical recovery.

Acute general or focal abdominal pain with nausea and vomiting, diarrhea or ileus and *low-grade elevation of temperature* has frequently been suspected of being the result of intra-abdominal catastrophe and followed by operation with negative results. In some instances these *symptoms were the prodromes of infectious* polyneuritis (Guillaine-Barre syndrome) or other virus invasions of the central nervous system. It is presumed that the portal of entry is intestinal. Nuchal or back stiffness and early paresthesia of an extremity may give a clue to the proper diagnosis, and abnormalities of the cell or protein content of the spinal *fluid confirm the suspicion.*

Hesitancy at stool and dysfunction of the bladder, either retention or frequency, *often lead to investigations of these systems*, when the actual cause is compression of the spinal cord at any level, with little complaint referable to the extremities in the sensory or the motor sphere. Such lesions are uncommon, but they are encountered often enough to be kept in mind.

Pain and occasional vascular change in the area of the scrotum, with associated pain in the flank, tend at times to incriminate the local structures, when they are actually due to irritation of a middle or low lumbar root. This is not uncommon with lesions of the discs or other cauda equina lesions. All *too commonly the syndrome* appears without complaint of the back as an early feature. Vigorous percussion over the lower portion of the spine or acute movements of the back may produce dorsal pain not previously noted. In a similar manner, bilateral or deep pelvic pain, paresthesia or cramps may direct *attention to the local organs* when a cauda equina lesion is the true offender.

Certain generalities are observed: Pain *of root or spinal origin* is ordinarily less in the upright position and worse in bed. Coughing, sneezing or straining usually aggravates the pain by altering the intraspinal dynamics and displacing the of*fended nerve root more vigorously into its* abnormal position. The lesser mechanical lesions, such as early tumor and dislocation of the disc, tend to come and go for no apparent reason, owing to the relatively *small mechanical displacement necessary* to aggravate or improve the symptoms. The mode of onset and rapidity of development naturally vary with the mechanical and histologic cl f the lesion, *and few generalitie* *ysic* examination often w cally tender or painful spinal level on movement or percussion at the site of the lesion. Occasionally sensory areas of defect can be mapped out, but in most instances one must rely on the patient's statement of his sensations as to which root is involved. Confirmatory evidence in the form of reflex or motor disturbance is always helpful but often absent in the early stages. Spine roentgenograms are helpful with a minority of early lesions, as usually bone destruction has not yet occurred. Often there is altered alignment of the vertebral column due to muscle spasm, and this is a helpful additional sign. Spinal puncture is often a critical diagnostic tool if the physician does the vital laboratory studies himself or has implicit confidence in the reliability of the technician; otherwise, it is often highly misleading. At times, myelographic visualization of the subarachnoid pathways must be resorted to in making a definite diagnosis.

SUMMARY

Certain cerebral and spinal syndromes are reviewed. The symptomatic development of these is recounted, with an effort to point out that the early complaints and signs are often in distal sites or viscera and therefore tend to mislead the clinician away from the true diagnosis. Certain features characteristic of spinal pain and some common clinical and laboratory aids are pointed out, which the author hopes may be helpful.

RIASSUNTO

Vengono passate in rassegna alcune particolari sindromi cerebrali e spinali allo scopo di dimostrare che i loro sintomi all'inizio sono spesso riferiti a sedi disparate o a visceri lontani e portanto tendono a essere misconosciute. Vengono portati ad esempio certi aspetti caratteristici del dolore spinale e alcuni dati clinici e di laboratorio che possono essere di aiuto nella diagnosi.

ZUSAMMENFASSUNG

Der Verfasser prüft gewisse zerebrale und spinale Syndrome und berichtet im Einzelnen über die Entwicklung ihrer Symptome. Dabei bemüht er sich klarzulegen, dass die ersten Beschwerden und Krankheitszeichen häufig in abgelegenen Gegenden oder Organen auftreten und dadurch zu einer Ablenkung des untersuchenden Klinikers von der richtigen Diagnose führen können. Er hebt gewisse charakteristische Eigenschaften des spinalen Schmerzes und einige der üblichen klinischen Untersuchungsmethoden und Laboratoriumsverfahren, von denen er eine Hilfe zur Diagnosestellung erhofft, hervor.

RÉSUMÉ

L'auteur passe en revue certains syndromes cérébraux et spinaux, ainsi que leur évolution, afin de démontrer que les troubles et signes précoces sont souvent localisés dans des régions ou des viscères distaux, ce qui peut donner lieu à des erreurs de diagnostic. L'auteur énumère un certain nombre de caractéristiques de la douleur spinale, et donne quelques points de repère clinques et de laboratoire permettant d'éclairer le diagnostic.

SUMARIO

O autor faz a revisão de certos síndromes cerebrais e espinais. O seu desenvolvimento sintomático é descrito, em um esforço para salientar que as quiexas e sinais precoces encontram-se frequentemente em locais distais ou vísceras e que portanto tendem a desviar o clínico do diagnóstico. Certas feições características da dor espinal e alguns achados comuns clínicos e de laboratério são apontados pelo autor, na esperança de que possam ser úteis.

Obstetric and Gynecologic Surgery

Complications of Pelvic Surgery: Hemorrhage

ZEPH J. R. HOLLENBECK, M.D., F.A.C S.
COLUMBUS, OHIO

LITTLE has been said or written of late about hemorrhage as a complication of gynecologic surgical intervention. Hemostasis is considered one of the basic principles of good surgical technic, and to mention one's experience with it may be to admit inferiority as a surgeon! I am quite sure, however, that all surgeons have had to contend, at one time or another, with this difficult and exasperating complication of gynecologic surgical procedures, either vaginal or abdominal.

In operations on the cervix, for instance, there is a tendency to use deep figure-of-eight or Sturmdorf type sutures and also to use too many and tie them too tightly. This results in postoperative necrosis, late sloughing and hemorrhage. In tracheloplasty it is definitely advantageous to use as few sutures as possible to bring together the tissues that are to be approximated, and to use fine suture material. It is quite obvious that a No. 000 suture cannot be tied as tightly as a No. 1 chromic catgut. The use of the more or less routine vaginal pack saves the surgeon from loss of sleep associated with fairly early postoperative hemorrhage after vaginal and cervical plastic operations, but its use is not advocated after cautery amputation of the cervix, because its removal has a tendency to incite hemorrhage. In electrosurgical treatment of the cervix it is advisable to use a cutting current with moderate coagulation qualities and to be conservative in the use of the coagulation current. This minimizes tissue destruction and subsequent slough. This procedure at times has been the bane of my existence and though I still occasionally do a conization of the cervix with the cutting current, I swear periodically that I will never do another.

The single maneuver in vaginal hysterectomy that keeps the surgeon out of difficulty with hemorrhage is, in my opinion, closure of the peritoneum. Although this is not an essential part of the operation, it does bring all of the potential bleeders outside the peritoneal cavity, and frequently the manipulation associated with closing the peritoneum will reveal a bleeding point that has been temporarily quiescent.

The control of postoperative vaginal bleeding following hysterectomy or vaginal plastic work is usually best accomplished by adequate packing of the vagina after removal of all clots. If a bleeding point is visible it should, of course, be clamped and tied. If the bleeding continues there is a strong tendency to repack. This is a mistake. To save time and blood, the patient should be taken to the operating room and anesthetized. Then, with adequate light and assistance, the bleeding

---

Read at the Twentieth Annual Congress of the United States and Canadian Sections, International College of Surgeons, Philadelphia, Sept. 12-15, 1955.
Submitted for publication Jan. 28, 1956.

point can be found and properly managed. Of course, if the initial hemorrhage is severe, this should be done at once, without any attempt to stop the bleeding by packing except as a stopgap procedure while the patient and the operating room are being prepared for action.

A word about the management of abortion seems indicated. It has been the policy at the Ohio State University Hospital for the past several years to perform dilation and curettage routinely in all cases of abortion. This saves considerable time and blood for the patient, prevents severe late hemorrhage and reduces the possibility of infection to practically nil. In cases of nonseptic spontaneous abortion this is done immediately; septic patients are treated for twenty-four to thirty-six hours before the operation with antibiotics. Over 90 per cent of all women hospitalized for abortion are discharged from the hospital within twenty-four hours.

The use of uterine tourniquets of various types, such as rubber bands placed around the lower uterine segment, or atraumatic vascular clamps, may be quite acceptable for the control of bleeding during multiple myomectomy. This method probably was conceived during exasperating attempts to control bleeders in the uterine wall with the usual type of hemostatic forceps. The best method of controlling such vessels is undoubtedly with Allis clamps or some modification thereof, or a similar instrument. Approximation of the defect then by fine interrupted figure-of-eight sutures controls the bleeding points, and no attempt need be made to ligate them individually. Because of the major problem of the control of hemorrhage, myomectomy should not be attempted at the same time as cesarean section. The exception to this rule is in the case in which there is a pedunculated tumor or there is obvious vascular difficulty after contraction of the uterus.

If severe postoperative hemorrhage occurs after abdominal hysterectomy, it is usually from the angle of the vagina, the uterine artery or its cervical branch; occasionally it is from the ovarian vessels. Two general technics are used in ligation of the larger vessels: one, a single suture ligature of the crushed broad ligament, usually in two sections, on either side of the uterus; the other, isolation of the uterine vessels and individual ligation. It has been my practice to continue the "old-fashioned" method, using a double strand of No. 1 chromic suture to accomplish this suture-ligature. With this method there is no difficulty in breaking the suture, and in my opinion it is less likely to result in ureteral damage than is individual isolation and ligation of the uterine blood supply medial to the ureters. With radical hysterectomy there is no comparable problem, because the ureter is out of the way and the vessels are tied at their origin from the hypogastrics.

The control of bleeding from vessels deep in the pelvis during radical hysterectomy and pelvic lymphadenectomy may at times be extremely troublesome. The deep branches of the internal iliac and obturator vessels, especially the veins, where they are in close proximity to the skeletal structures, can be ligated only with difficulty. A great deal of blood and time may be lost in attempts to ligate them. A silver clip applied with the long clip applicator forceps makes this a simple matter. Silver clips may also be used to control the arteries and veins supplying the lymph nodes that lie in close proximity to the great vessels.

The artificial creation of a state of controlled shock, called hypotensive anesthesia, is a method devised to enable one to do time-consuming operations in a shorter period, with less actual blood loss. My experience with this method is limited, but my opinion is that it need not and probably will not become universally practiced by gynecologists. It is difficult and must be accomplished under the direction of a very skillful anesthesiologist. It seems to me that when a surgeon gets so old that he is unable to withstand a three-hour, four-hour or five-hour gynecologic operation he should have perfected his technic to such point that the operation would not have taken so long in the first place. From the view of the patient's benefit it is better to calculate the amount of blood lost and to begin replacement early.

Accidental injury to the iliac arteries and veins should be controlled by immediate suture of the defect and the use of gelfoam sponges or film to cover the repair. The old trick of using a piece of muscle works just as well.

If hemorrhage from the vessels on one side of the pelvis becomes uncontrollable, there is no reason why the hypogastrics cannot be ligated above and below the bleeding point. This is true too of the uterine vessels when the uterus is to be conserved. The *collateral circulation is* adequate.

Shock that occurs several hours after pelvic laparotomy and responds to blood transfusion, only to recur, means one thing to me — concealed hemorrhage. In spite of the absence of signs of intra-abdominal fluid and of laboratory evidence of anemia, the patient exhibiting this syndrome should be taken to the operating room and a laparotomy performed. A patient *with retroperitoneal bleeding may* show no signs of intra-abdominal fluid, and the initial shocking hemorrhage, or even the second one, may fail to make itself evident in the circulating blood picture.

In conclusion, a few words of caution are in order. A thorough knowledge of the anatomic aspects of the vascular system and its variations is as important to the surgeon as his string of hemostats.

One must not overlook the possibility of the occasional case of blood dyscrasias, especially thrombocytopenia. Defibrination of the blood by activation of the blood-clotting system at some intermediate point has been discussed at some length in the recent literature. This is especially applicable to abruptio placentae. The identical picture, which may also lead to lower nephron nephrosis, follows transfusion with incompatible blood. The same problem may arise in a case of near exsanguination hemorrhage. In the anesthetized patient, during the operation, the situation may make itself manifest only by uncontrollable hemorrhage, especially *from the smaller arteries and veins of raw* surfaces. If any doubt arises, a tube of blood should be drawn from the patient and the "clot observation test" carried out.

The surgeon who makes free use of suction to keep his operative field dry must *constantly be aware of the danger involved* if he or his assistant has the habit of leaving the suction tip in the depth of the pelvis while the surgeon's attention is drawn to another point in the operation. The suc*tion tip may be directly over an opening* in a large blood vessel and considerable blood may be in the suction bottle before the problem is recognized. This is true particularly of the suction tip placed inside the uterus during uterine closure in cesarean section.

It seems hardly necessary to mention here the extreme importance of blood replacement in cases of shock, before anything else is done to the patient. Shock *must be controlled before any anesthetic* is administered or any operative procedure begun. I was once told that it was necessary to open a patient's abdomen to control the bleeding point before the shock *could be successfully combated,* because the blood would run out as fast as it could be put in. Do not forget that in the presence of profound shock—which is nature's way of controlling a severely bleeding point—the blood is not running anywhere. Shock must be corrected before anything else is done to the patient.

SUMMARY

Hemorrhage occurring as a complication of pelvic surgical procedures in women, e.g., after operations on the cervix, hysterectomy, or vaginal plastic procedures, as well as after abortion, is discussed, with recommendations for its prevention and control. It is emphasized that a thorough knowledge of the vascular system is essential. The possibility of blood dyscrasias, particularly thrombocytopenia, must be kept in mind. If the patient is in a state of shock, blood replacement should be accomplished first of all, before operation is begun or any anesthetic is used.

ZUSAMMENFASSUNG

Es liegt eine Erörterung von Blutungen vor, die als Komplikation bei Eingriffen am weiblichen Becken auftreten, z. B. nach Operationen am Kollum, nach Gebärmutterresektion, nach plastischen Operationen an der Scheide oder nach Aborten. Mittel und Wege, diese Blutungen zu verhüten oder zu kontrollieren, werden empfohlen. Es wird betont, dass eine genaue Kenntnis des Blutgefäss-systems wesentlich ist. An die Möglichkeit von Bluterkrankungen, besonders der Thrombozytopenie muss gedacht werden.

Wenn die Patientin sich im Schock befindet, muss vor allem für Blutersatz noch vor Einleitung einer Anästhesie gesorgt werden.

RÉSUMÉ

L'auteur présente une étude des complications hémorragiques lors d'opérations pelviennes chez la femme, par exemple après des opérations sur le col, après une hystérectomie ou une plastique vaginale, ainsi qu'après un avortement. Il énonce des règles pour leur prévention et leur contrôle, soulignant la nécessité d'une connaissance approfondie du système vasculaire. Il ne faut pas négliger la possibilité d'une dyscrasie sanguine, particulièrement d'une thrombocytopénie. Si la malade se trouve en état de choc, il faut immédiatement, avant l'emploi de tout anesthésique, pratiquer une transfusion sanguine.

RIASSUNTO

Viene trattata l'emorragia che può prodursi come complicazione de interventi pelvici sulle donne, come per esempio dopo operazioni sul collo uterino, isterectomie, plastiche vaginali o aborto. Si sottolinea il fatto che è indispensabile una conoscenza complete del sistema vascolare e che è necessario considerare l'eventualità delle discrasie e specialmente della trombocitopenia. Se la paziente è in shock la prima cosa da fare, prima di usare qualunque anestetico, è la somministrazione di sangue.

SUMARIO

O autor discute a hemorragia que ocorre como complicação de intervenções pélvicas em mulheres, como por exemplo depois de operações no cérvix, histerectomias, ou métodos plásticos vaginais, bem como depois de abôrtos, com recomendções para sua prevenção e controle. Chama a atenção para o fato de que o conhecimento total do sistema vascular é essencial. Dever-se ter em mente a possibilidade de discrasias do sangue, particularmente trombocitopenia.

Se o paciente estiver em estado de choque, a reposição do sangue deve ser feita primeiramente, antes que se use qualquer anestésico.

Obstetric and Gynecologic Problems in General Practice

ALLEN T. STEWART, M.D., F.I.C.S.

LUBBOCK, TEXAS

MEDICAL service follows the pattern of the times. In the horse and buggy days life moved more slowly, the majority of the population was rural, and the general practitioner or family doctor, the central figure in many a novel or poem, was an important leader in any community. As people began to congregate in cities, as the preponderance of our population shifted from rural to urban, definite changes occurred in the practice of medicine. The age of specialization began. Cities were large enough that a man could make a good living by treating only those who were referred to him by others, and whom he had not previously seen.

Small wonder that the pendulum swung too far in the opposite direction. The percentage of specialists became too preponderant, the medical schools pointed toward specialization, and the general practitioner seemed to be on the way out. Rural areas began to lose their old-time doctors and there were no young ones to take their places. Everyone looked to the city, and the automobile quickly carried them there for trade, for amusement, for education, for professional service, for worship.

The American Medical Association became concerned about the situation, and its board of trustees appointed a council on rural health in 1945, which has held annual conferences with farm leaders, farm editors, and members of the extension service of land grant colleges. This work has created better public relations

---

Read at the Nineteenth Annual Congress of the United States and Canadian Sections, International College of Surgeons, Chicago, Sept. 9-10, 1954.

Submitted for publication Jan. 2, 1955.

Now, since the general practitioner is the family doctor and since families are composed chiefly of women and children, who, by the way, usually do not minimize or conceal their aches and pains but seek help promptly, it follows that, in addition to cuts and bruises and sore throats, a large proportion of the general practitioner's patients will be women, and his daily work will deal with those disorders related to or resulting from the act of reproduction. Hence obstetrics and gynecology usually demand the bulk of his time. This being true, it is not amiss to review some of the problems in this field which daily confront him.

In the past decade or so, intensive prenatal care has greatly reduced the incidence of toxemia; prenatal care plus asepsis plus antibiotics has reduced the incidence of infection. Hence, in the past decade, hemorrhage, the last of the triad dreaded by obstetricians, has replaced infection as the leading cause of maternal deaths.

Although there has been a 75 per cent reduction in maternal mortality in the past two decades, the results are still far short of the possibilities. Today 8 of 10 patients with puerperal infection, 7 of 10 with toxemia and 6 of 10 cases with hemorrhage will survive. Of the three great terrors of obstetrics, therefore, hemorrhage still looms as the most formidable, the most likely to cause maternal death. The most dangerous types of hemorrhage occur in the postpartum period and in cases of placenta praevia, abruptio placentae, and ectopic pregnancy. Of these, postpartum hemorrhage is perhaps the most common, since the other types are relatively infrequent. Postpartum hemorrhage has an incidence of 2 per cent in the larger American institutions and, in general, an overall incidence of 10 per cent. Delay in recognition, in instituting blood replacement, and in employing definitive treatment result in death from postpartum hemorrhage.

As a prophylactic routine to prevent this complication, McCartney[1] has advocated avoidance of deep sedation and deep general anesthesia, a thirty-second pause after delivery of the fetal head and the anterior shoulder, and the administration of ergot after delivery of the posterior shoulder. He urges that an interval of three minutes be allowed to elapse from the time the delivery is started until the head and shoulders are delivered, insisting that this allows proper retraction of the placental site. The placenta should be expressed, but during its expression the uterus should be held out of the pelvis. In contradiction to much medical school teaching of the past, he favors prompt manual removal of the placenta if there is uterine bleeding before the placenta is expressed or if the placenta is not separated in fifteen minutes.

With all these types of hemorrhage the treatment can follow only two courses: replacement of lost blood and whatever definitive measures are needed to stop the flow of blood at its source. Within the last few years, since discovery of the importance of the Rh factor, blood transfusion has become a relatively safe procedure and blood has been more readily available, as have blood substitutes and blood components. By and large, the incidence of deaths from postpartum hemorrhage constitutes a derogation of the skill of the physician in attendance. In passing, one common error in gauging the extent of the hemorrhage is that the clot volume of blood[2] represents only 40 per cent of the blood loss. Hence a clot volume of 1,500 cc. would mean that the patient had actually lost a volume exceeding 2,500 cc.

Space does not permit a review of all the types of hemorrhage here, nor is it in order, since in 1953 a masterful presentation of the management of hemorrhage from the genital tract during late pregnancy, labor, and the puerperium was published by Pieri.[3] One sentence of that treatise states: "It has been observed that, in cases of abruptio placentae, the coagulability of the blood undergoes such alteration (toxin) that bleeding elsewhere in the body may ensue." Indeed, this sometimes occurs to such an extent that *even after abdominal section the patient* may continue to bleed from the suture lines, the cervical stump, the ligatures and even from the lungs, stomach, bowel, bladder and subcutaneous areas. This alarming condition, one that becomes rapidly a fulminating emergency, is associated with premature separation of the normally implanted placenta or with amniotic fluid embolism (infusion); it occurs also in cases of long-standing fetal death. The common characteristic of these three widely different conditions is that the blood becomes incoagulable. Transfusions do not reverse the situation and rarely replace the lost blood rapidly enough. This peculiar condition was first noticed by De Lee[4] and called uterine hemophilia. Later Wilson[5] compared it to that observed in the blood of snake-bite victims and considered the *activating factor a circulating* toxin. Later Dieckmann[6] called attention to the presence of afibrinogenemia in such cases. *Then Reid[7] and his associates advanced* the idea that in these cases the amniotic fluid gains entrance to the maternal *circulation and, being charged with* thromboplastin, causes intravascular clotting, which defibrinates the blood and renders *it incoagulable*. Such blood, when drawn, will not clot or forms a clot that soon disintegrates; also, such a clot dissolves when incubated at 37 C. for one hour. This is a simple test to warn the obstetrician of the presence of this syndrome, and when the result is positive there is only one course—prompt restoration of the fibrinogen level of the blood to a level above that of danger from hemorrhage, i.e., to 150-200 mg. per hundred cubic centimeters. Multiple transfusions alone are not enough, since a single transfusion of 500 cc. may raise the fibrinogen level only 5 or 10 mg. per hundred cubic centimeters. *If the fibrinogen is raised to* the normal level the condition of the patient is less precarious and delivery can be *planned. The consensus now is that labor* can usually be terminated by pelvic delivery after rupture of the membranes, or, *if labor* does not ensue after this procedure, by abdominal section. Indeed, rupture of the membranes decreases intrauterine pressure and halts the forcing of thromboplastic material into the circulation, reversing the condition. An alert general practitioner can forestall many a serious situation by detecting afibrinogenemia by the clot test, after which he can institute measures to raise the fibrinogen level, by injection of Cohn's fraction No. I. What formerly was usually a disastrous situation may now be met with more hope of a happy outcome.

Another source of hemorrhage, not often mentioned but frequently productive of fatal thrombosis and embolism, is varicosity *of veins, in the lower extremity,* the vulva, the vagina and the pelvis. It is surprising that this potential source of hemorrhage *is seldom mentioned in the literature*. In performing cesarean section or other pelvic operations, I have marvelled at the massive varices often present in the mesosalpynx and broad ligaments, and I have wondered why a vigorous Crede expression in such a case has not resulted in rupture and fatal intraperitoneal hemorrhage.

The potential danger from varices of the pelvis was brought alarmingly to my *attention by the following case:*

Mrs. E., aged 32, para 2, had had normal delivery, with nothing remarkable in her history. *On hearing from her husband, by tele-*

phone late one night, that she was bleeding badly, I instructed him to call an ambulance and send her to the hospital. While I was dressing the night supervisor called to say that the patient had arrived and was in a desperate condition. A plasma transfusion had been started. Before I left the house she called again, stating that in her opinion the patient was dying. On reaching the hospital, I found that the supervisor had wisely left the patient on the ambulance stretcher and was giving plasma intravenously.

Severe shock and hemorrhage were present. The pulse was imperceptible and the respiratory rate 6 per minute. The skin was cold and clammy and bathed in sweat. During administration of the second bottle of plasma there was enough improvement in the patient's general condition to justify transferring her to the operating table, where she was placed in the lithotomy position. After the clots had been sponged out, the source of the bleeding was discovered to be a large ruptured varix on the right vaginal wall, about 3 inches (7.5 cm.) from the introitus. A wide mattress suture about the bleeding point easily controlled the hemorrhage, and the patient's condition improved rapidly. She was discharged on the following day, having been given 1,500 cc. of blood and 1,000 cc. of plasma. Up to the time of writing, hemorrhage has not recurred. Incidentally, the hemorrhage had been initiated by coitus.

After such an experience, I have looked askance at all varices of the lower extremity, the vulva and the vagina. In 2 of my patients, each gravida 3 and para 2, massive varices of the vulva, the labia and the vagina have developed during pregnancy. Both women were delivered by cesarean section. The fact that the varices promptly receded in the postpartum period has not changed my conviction that this method of delivery was the correct one.

The greatest responsibility of the general practitioner is in the detection of cancer. In the great majority of cases he is the first man to see the cancer patient, or as Novak[8] stated, the patient's first "port of call." Bloodgood[9] has said that the more easily the cancer is detected the worse is the prognosis. Hence the conduct of the general practitioner at the first examination either seals the patient's doom or initiates proper treatment that will insure arrest of the tumor. It is a great service to add many useful, productive years to the life of a wife and mother. It is a terrible indictment that this duty and responsibility is too often neglected. Recent surveys have revealed some data not too complimentary to the medical profession. According to Crossen,[10] 75 to 90 per cent of patients with early cancers can be saved by early adequate treatment. In Philadelphia, Howson and Montgomery[11] reported that in 1,140 cases the untoward results were due to delay on the part of the patient in 56 per cent. Such delay was defined as the time elapsing from the first symptoms until medical advice was sought. In 24.5 per cent of cases (almost 1 in 4) the delay was laid at the door of the physician, in which cases the average duration of delay was seven and four-tenths months. In 51 per cent of these cases no vaginal examination was done. Now, since little is known about the cause of cervical cancer, nothing can be done to lower the incidence, but certainly the facts mentioned show that early detection and treatment offer the only means of lowering the fatality rate of 20,000 cases of cancer each year. To reduce this number, there must first be a population alert to the danger of cancer. Thanks to the educational campaign of the American Cancer Society, this goal is being attained, and with it a generous proportion of cancerophobia. Next, there must be alert, trained physicians to detect malignant change in the beginning and start treatment, or allay the patient's fear when there is undue alarm.

It is not to be expected that the general practitioner will be equipped to treat early cancer in all cases, but he must be prepared to take all available measures of detection within present knowledge. He cannot disregard such symptoms as inter-

menstrual bleeding, irregular bleeding at the menopause, postcoital bleeding or bleeding after a douche. Every general practitioner can perform Schiller's iodine test to detect suspicious areas and can then do a biopsy. Te Linde[12] insists upon biopsy of any granulation tissue that bleeds, any leukoplakic spots, any polypoid areas with a large base, any hard area covered with epithelium, any localized ulcer, or any erosion that fails to clear up after cauterization.

The Papanicolaou smear is a valuable addition to the physician's armamentarium, though it does not necessarily supply the final word in diagnosis. *Frequently it will reveal suspicious cells that may* not have been detected otherwise, and then biopsy can confirm or refute the result. It is especially useful in the detection of cancer *in situ,* a condition in which the full thickness normally occupied by stratified epithelial cells is replaced by malignant cells. The cervical glands may be invaded, with complete destruction of columnar epithelium, but the subepithelial structures are not invaded. Such a condi*tion may stay dormant for years but is* always potentially dangerous and calls for amputation of the cervix or total hysterectomy.

It is not expected that every general practitioner can read a Papanicolaou smear, but it is not too much to expect that he be able to secure such smears and *get them into the hands of a capable path*ologist. If this procedure, followed by biopsy, became the order of the day, the percentage of Grade I and Grade II carcinoma detected would increase and the percentage of survival would mount, since 75 per cent of patients with such low-grade neoplasms survive. There must be a greater salvage of this all-important segment of our population. To an enormous extent the integrity of the home and the maintenance of wholesome society de*pend upon it. Women know that the re*productive act predisposes to cancer of the breast and of the generative tract. They must be enabled to face motherhood with less fear of this dread specter.

*Although the reproductive act contrib*utes more to the work of the general practitioner than does anything else, he is frequently confronted with its opposite, sterility. The sterile couple merit every consideration, the best technical service and the keenest diagnostic acumen. They frequently travel from doctor to doctor in their vain search for help. This condition has been the object of much research and experimentation. Rubin[13] has recently *presented an exhaustive review.* This treatise covers every phase of the physical basis for sterility and leaves nothing to be added in the conduct of procedures for diagnosis and treatment. It is doubtful that anything helpful can be added to the current knowledge of the physical side of this deficiency. Dr. Rubin is wise, however, in suggesting that a diagnosis of absolute sterility should rarely be made known to a couple, because of the psychic effect. The *realization that one is hopelessly sterile is* a severe shock and may lead to grave conflicts. One cannot minimize, either, the psychosomatic factor in gynecologic disorders. Says Rubin, "Nature does work 'miraculous cures,' while prognosis is not always infallible." It is known that many cases of sterility are unexplainable on a purely physical basis; that such psychic factors as worry, stress, and strain invite peptic ulcer, colitis, asthma, migraine, hypertension and coronary disease. If such anxiety stresses may cause lesions in the various organs, is it unreasonable to *assume that psychic stimuli can set up* pathologic reactions in the reproductive organs, with resultant dysmenorrhea, abortion or *sterility?*

These facts still leave the general practitioner in the pivotal position. In his role as family physician and confidential adviser, he may be of great help in making the burden of disappointment and the feeling of futility less heavy. Frequently he can solve the problem by arranging for the adoption of a child. This alone may result in subsequent successful pregnancies, a phenomenon too frequent to be regarded as merely coincidental and strongly significant of the deeply hidden influence of the psyche upon the reproductive functions.

The general practitioner is neither god nor superman, but he does occupy a strategic position in rendering service to women. He is the liaison officer between the family and the specialist. In the proportion that he is well trained, alert and conscientious, he will decrease the incidence of morbidity and death from hemorrhage, cancer and sterility. May his tribe increase!

SUMMARY

The author urges that more attention be given by the general practitioner to modern methods of obstetric and gynecologic treatment, especially with regard to hemorrhage, puerperal infection, placenta praevia, abruptio placentae, ectopic pregnancy and cancer. The greatest responsibility of the general practitioner is the detection of cancer in its early stages. He is not expected to be equipped to deal single-handed with any and all cancers, but he should be prepared to take all the measures now available. The problem of sterility is also one that should interest him deeply and call forth his utmost efforts.

RIASSUNTO

L'autore ritiene necessario che i medici generici pongano maggior attenzione ai più moderni metodi di cura in ostetricia e ginecologia, sopratutto in rapporto all'emorragia, all'infezione puerperale, alla palcenta praevia, alla rottura di placenta, alla gravidanza extrauterina e al cancro. La maggior responsabilità del medico pratico è rappresentata dalla diagnosi precoce del can cro. Non si pretende che egli sia attrezzato per la cura di essi, ma deve sapere quali sono le misure da prendere in ogni singolo caso. Anche il problema della starilità deve interessarlo a fondo e impegnarlo ad ogni sforzo.

RÉSUMÉ

L'auteur souligne la nécessité pour le praticien de médecine générale d'accorder une plus grande attention aux méthodes modernes de traitement en obstétrique et gynécologie dans les cas d'hémorragie, d'infection puerpérale, de placenta praevia, de placenta abruptio, de grossesse ectopique et de cancer. La responsabilité du praticien est grande dans le diagnostic précoce du cancer. On ne peut lui demander d'être suffisamment équipé en vue d'être à même de déceler tous les cancers, mais il devrait être apte à prendre toutes les mesures actuellement à notre disposition.—un autre problème auquel le praticien de médecine générale devrait consacrer toute son attention est celui de la stérilité.

ZUSAMMENFASSUNG

Der Verfasser richtet eine Mahnung an den in der Allgemeinpraxis stehenden Arzt, in Fällen von Blutungen aus den weiblichen Genitalien, von Kindbettinfektionen, Placenta praevia, Ablösung der Placenta, ektopischer Schwangerschaft und Karzinom den neuen Methoden geburtshilflicher und gynäkologischer Behandlung grössere Aufmerksamkeit zu widmen. Die höchste Verantwortlichkeit des praktischen Arztes liegt auf dem Gebiet der frühzeitigen Entdeckung des Krebses. Wenn auch nicht erwartet wer-

den kann, dass der praktische Arzt jeden Krebsfall allein zu behandeln in der Lage ist, so sollte es doch möglich sein, dass er alle notwendigen Schritte unternimmt, um die heute verfügbaren Massnahmen einzuleiten. Ein anderes Gebiet, das den Allgemeinpraktiker interessieren und zu voller Mitarbeti anregen sollte, ist das Problem der Unfruchtbarkeit.

SUMARIO

O autor sugere que o clínico geral dê mais atenção aos métodos modernos de tratamento [illegible] e ginecológico em relação à her[illegible]gia, infecção puerperal, placenta pr[illegible] [illegible]ruptio placentae, gravidez ectópica [illegible] r. A grande responsabilidade do [illegible] geral consiste na descoberta [illegible] r nos estágios primários. Não [illegible] que êle esteja equipado para trata[illegible] espécie de cancer, mas que esteja [illegible] para tomar tôdas as medidas agora viáveis. O problema da esterelidade é um que também deveria interessálo profundamente e exigir dêle o melhor de seus esforços.

REFERENCIAS

1. McCartney, C. P.: M. Clin. North America, 37:265-277, 1954.
2. Weiner, A. E.; Reid, D. E., and Roby, C. C.: Am. J. Obst. & Gynec. 66:469, 1953.
3. Pierl, R. J.: J. Internat. Coll. Surgeons 20: 77-93, 1953.
4. De Lee, J. B.: Principles and Practice of Obstetrics, 1901. Fifth edition, p. 468.
5. Wilson, P.: Surg., Gynec. & Obst. 34:67, 1922.
6. Dieckmann, W. J.: Am. J. Obst. & Gynec. 31:734, 1922.
7. Weiner, A. E.; Reid, D. E., and Roby, C. C.: Am. J. Obst. & Gynec. 66:475, 1953.
8. Novak, E.: Maryland State M. J. editorial, May 1953.
9. [illegible], J. C.: Cited by Novak.
10. Crossen, R. J.: Gen. Practice [illegible]
11. [illegible], J. T., and Montgomery, T. L.: Am. J. Obst. & Gynec. [illegible]
12. Te Linde, R. W.: Postgrad. Med. 14:244-[illegible]. Cited by [illegible]
13. [illegible], I. C.: J. Internat. Coll. Surgeons 21: 527-[illegible], [illegible].

LATE CORRECTION—The footnote denoted by double asterisks [illegible]

Ophthalmologic Surgery

Focal Infections and Their Relation to the Eye

HARRY M. SELDIN, D.D.S., F.A.C.D., F.I.C.D., F.I.C.A.
NEW YORK CITY, NEW YORK

IN 1951, the June issue of the *Journal of the American Dental Association* was devoted to "An Evaluation of the Effect of Dental Foci of Infection on Health."[1] A brief summary of the contents of this issue is contained in a quotation from a paper by Reiman and Havens[2] published in the *Journal of the American Medical Association* (Jan. 6, 1940), which quotation was actually used in the dental journal's summary: "It may be said, therefore, that (a) the theory of focal infection, in the sense of the term used here, has not been proved; (b) that infectious agents involved are unknown; (c) that large groups of patients whose tonsils are present are no worse than those whose tonsils are out; (d) that patients whose teeth or tonsils are removed often continue to suffer from the original disease for which they were removed; (e) that beneficial effects can seldom be ascribed to surgical procedures alone; (f) that the beneficial effects which occasionally occur after operation are often outweighed by harmful effects or no effect at all, and (g) that many suggestive foci of infection heal after recovery from systemic disease or when the general health is improved with hygienic or dietary measures."

With the publication of this issue of the *Journal of the American Dental Association*, on the basis of a three-year study of the theory of dental focal infection by members of the Schools of Dentistry and Medicine, at the University of Michigan, the pendulum of credulity and reliance on the theory of oral sepsis as a focal source of systemic or organic infection had completed its full arc—an arc that was set into rapid motion in the opposite direction by the classic comments of Hunter[3] in 1911 and Billings[4] in 1918.

No dentist and no doctor, I am sure, regrets the passing of the era of the so-called focal infection delirium, when teeth were removed in wholesale lots and entire communities were arbitrarily deprived of any tonsillar tissue outside the pathologists' specimen bottles. Perhaps the failure of such extreme practices inevitably paved the way to the opposite extreme, at which, in dentistry, the banner raised was inscribed "Save the tooth!" and caution as to the general health of the patient was tossed to the proverbial winds.

Today there are many factors that tend to negate the necessity for the detection and eradication of dental foci of infection. Among them are (1) the frequent failure of dental extraction to cure diseases of other organic systems; (2) the development and widespread use of antibiotics, which actually affect the original focus of infection; (3) the advent of use of the adrenal cortical steroids, which lessen the effect of dental foci on regional inflammation, and (4) the improvement in dental technics and procedures, particularly in

---

Read at the Twentieth Annual Congress of the United States and Canadian Sections, International College of Surgeons, Philadelphia, Sept. 12-15, 1955.
Submitted for publication Oct. 15, 1955.

the fields of endodontics and periodontics, *which eliminate many potential sources of* focal dental infection.

Regardless of all these factors, denial of the possibility and the not infrequent actuality of focal dental infection associated with a disease of a noncontiguous organ or system is denial not only of a huge amount of pertinent laboratory evidence but of a mass of clinical evidence that has been observed by almost every experienced practitioner of either medicine or dentistry, particularly dentists who specialize in surgery of the mouth and jaws.

Except for that field of medicine which is concerned with rheumatic heart disease and its sequelae, the endocardial infections, the fields of otolaryngology and ophthalmology are the most fertile in the *study of the role of dental foci of infection* in the causation of disease.

It is not my purpose to discuss the rationale of the theory of focal infection (i.e., the mechanism of its action), the possibility of bacterial spread in blood and lymph, the presence of bacterial toxins, the sensitization phenomena or the possible *relevance of the "alarm reaction."* These factors can best be dealt with in a laboratory under rigid scientific controls. Rather, I wish to express an opinion, based on observation, that I know is shared by many other oral surgeons: that many patients with uveal and other ocular diseases that will not respond to any other form of therapy do show improvement—often dramatic—after nothing more radical than simple extirpation of a diseased tooth or other source of oral sepsis.

If one accepts this thesis, however, one must also accept its limitations, real and potential. The major ones are as follows:

1. In most cases, uveal or other ocular diseases are not related to dental foci of infection.
2. On the other hand, in most persons with dental foci of infection (as differentiated *from focal infection), uveal disease* does not develop.
3. The ocular disease may be related to two or even to several foci, and elimination of only one may be insufficient.
4. Given sufficient time, the secondary disease process may have established its independent existence and may not respond even to complete elimination of the original focus.
5. The diagnosis of a related dental focus of infection may be extremely difficult. No test is available that will definitely identify such a focus.
6. It may be exceedingly difficult to remove all potential and actual oral foci of *infection, as has been noted with the* rather common gingival or periodontal inflammatory disease.

Thus it becomes obvious that the situation is rather complex. When a patient with ocular disease resistant to other forms of therapy is referred to the dentist for the diagnosis and elimination of a possible related *focus of infection, the dentist* is often confronted with an extremely difficult task. How is he to determine (1) what are the actual or potential foci of infection in the patient's mouth? and (2) are these foci related to the ocular disease?

To begin with, there is no accurate test for a focus of infection. Electrical or electronic tests may, with considerable accuracy, determine the presence or lack of vitality of a tooth. Yet all are agreed *that not all nonvital teeth present any* evidence of infection. Laboratory tests have amply demonstrated that cultures of apical material from nonvital teeth often produces no evidence of bacterial contamination. Burket,[5] in a study of human necropsy material, observed that of 419 periapical areas of radiolucency analyzed only 206, or 49 per cent, contained organisms. Morse and Yates,[6] in 1941, noted that 22 per cent of a group of nonvital teeth with roentgen evidence of periapical osseous destruction yielded negative cultures. Other studies by Sommer and Crowley in 1940,[7] Hayes in 1943,[8] and Ostrander et al in 1947[9] and 1948[10] showed that 11 to 58 per cent of nonvital teeth will yield negative bacteriologic cultures, depending on their roentgenographic classification. Thus it is apparent that even roentgen evidence of periapical pathologic change is not always indicative of bacterial infection.

Turning for a moment to the vitality situation, one sees that even a vital tooth may be a source of bacterial infection, particularly when it causes pain. Studies by Hayes in 1943[8] and Ostrander and Crowley in 1948[10] demonstrated that 50 to 55 per cent of the root canals of vital teeth yield positive cultures in patients who have pain prior to extirpation of the pulp.

To complicate the dentists' problem further, there are problems of the periodontal structures. Gingival inflammation with accompanying deep periodontal pockets is very common. Studies have amply confirmed that these pockets harbor a variety of potentially pathogenic organisms. These organisms (or their toxins or antibodies) can readily pass into the blood stream. Murray and Moosnich[11] in 1941 produced transient bacteremias in 55 per cent of patients with varying degrees of periodontal disease and caries merely by having these patients chew on paraffin cubes for half an hour. Okell and Elliot[12] observed 34 per cent transient bacteremia in 34 per cent of patients whose teeth were extracted in the absence of obvious periodontal disease, while 75 per cent of extractions in periodontally diseased mouths produced bacteremias. Others have demonstrated this transient bacteremia merely by massage of inflamed gums.[13]

The difficulty of the diagnostic problem becomes even more obvious when one considers, as one must, other possible oral foci of infection in the mouth of the patient. These would include pericoronal infections, residual infections, partially or totally impacted teeth, cysts, salivary calculi, and the multitudes of conditions lumped under the classification "stomatitis."

Clinically speaking, on this maze of uncertainties only the well-trained dentist can hope to shed the enlightenment that may result in the eradication of dental infective foci. I wish to stress this point, for all too frequently the dentist is directed by the patient's physician to perform certain dental procedures despite the physician's lack of understanding of the problem from a dental viewpoint.

With the innumerable difficulties the dentist faces, is there a logical and orderly procedure he can follow? The one I suggest is as follows:

1. Every patient with ocular disease, regardless of the possibility of a dental focus of infection should have a complete dental examination.

2. If this examination reveals dental disease, with foci of infection, these should be eliminated for the general well-being of the patient.

3. After extensive otolaryngologic examination and treatment, a patient whose ocular disease does not respond to other forms of therapy should be referred to an oral surgeon for dental examination and consultation.

4. It should be the responsibility of the dentist, in collaboration with the referring ophthalmologist, to determine as far as possible what are the real or potential oral foci of infection.

5. Teeth or other oral structures should not be ruthlessly sacrificed. In consideration of the importance of eyesight, however, the dentist should be prepared to execute more than usually radical judg-

ment in the elimination of possible foci of infection.

The author also suggests (1) that all teeth showing periapical disease other than cementoma should be extracted or subjected to root canal therapy as indicated in the individual case; (2) that all retained roots and areas of residual infection should be excised; (3) that all dental caries should be excavated and the cavities filled if possible, or the affected teeth extracted if necessary; (4) that periodontal care should be a paramount consideration; (5) that partially impacted teeth should be removed; (6) that completely impacted teeth should be removed if it is possible to do so without extensive mutilation of the oral structure, and (7) that all other pathologic lesions, such as cysts and neoplasms, should be removed or otherwise treated.

It should be noted that such care as has just been described is actually that which all patients should receive, regardless of the possibility of focal infection. An increased degree of thoroughness and an increased extent of sacrifice of dental structures, however, may be called for when the possibility of dental focal infection must be eliminated. The degree and extent of infection that indicate this must vary with the individual patient and the circumstances, and must depend on integrated consultation between ophthalmologist and dentist.

SCHLUSSFOLGERUNGEN

1. Jeder Augenkranke sollte einer umfassenden zahnärztlichen Untersuchung unterzogen werden, gleichgültig ob Anzeichen eines infektiösen Herdes am Zahn bestehen oder nicht.

2. Ergibt die Untersuchung eine Zahnerkrankung mit Infektionsherden, so müssen diese im Interesse d[illegible] zustandes des Kranken [illegible]

3. Kranke, deren Augenleiden nach umfangreicher otolaryngologischer Untersuchung und Behandlung auf andere Formen der Therapie nicht anspricht, sollten einem Mundchirurgen zur Untersuchung der Zähne und zur Konsultation überwiesen werden.

4. Es sollte die Aufgabe des Zahnarztes sein, in Zusammenarbeit mit dem überweisenden Augenarzt die tatsächlichen oder möglichen Infektionsherde soweit wie möglich zu bestimmen.

5. Wenn auch die Zähne oder andere Teile der Mundhöhle nicht rücksichtslos geopfert werden dürfen, so sollte doch der Zahnarzt geneigt sein, angesichts der Wichtigkeit der Sehkraft die Indikation zur Entfernung möglicher Infektionsherde radikaler als sonst üblich zu stellen.

Der Verfasser schlägt ferner vor, (1) alle Zähne, die periapikale Erkrankungen (mit Ausnahme der Zementgeschwulst) aufweisen, zu extrahieren oder je nach Lage des Falles einer Wurzelkanalbehandlung zu unterziehen, und (2) alle zurückgebliebenen Wurzeln und Gebiete mit restlichen Infektionsherden zu resezieren.

CONCLUSIONS

1. Tout malade atteint d'une affection oculaire devrait subir un examen dentaire complet.

2. L'élimination des foyers d'infection dentaire s'impose.

3. Après examen et traitement oto-laryngologiques, tout patient dont le status oculaire n'est pas amélioré par d'autres formes de traitement, devrait être adressé à un dentiste.

4. C'est au dentiste, en collaboration avec l'ophtalmologue, qu'incombe la détermination—autant qu[illegible] peut des foyers d'infection.

[illegible] cas l[illegible]

devraient être sacrifiées à la légère. Mais étant donné l'importance primordiale de la vision, le dentiste devrait pouvoir aller au-delà d'un examen de routine afin d'éliminer tous les foyers possibles d'infection.

L'auteur suggère: 1) que toutes les dents présentant une affection péri-apicale autre qu'un cémentome, soient extraites ou soumises à un traitement de racines; 2) que toutes les racines et les foyers d'infection résiduels soient excisés.

CONCLUSIONI

1. Ogni malato con affezioni oculari deve essere esaminato dal punto di vista dentario, indipendentemente dalla possibilità di focus dentari o infezioni.
2. Se questo esame dimostrerà la presenza di foci o infezioni, queste devono essere eliminate per il benessere del paziente.
3. Dopo un completo esame otoiatrico, i malati le cui effezioni oculari non rispondono alla terapia devono essere affidati ad un chirurgo della bocca per un esame dei denti.
4. Il dentista deve avere la responsabilità, assieme all'oculista, di stabilire il più accuratamente possibile quali siano i reali o possibili foci di infezione.
5. Denti o altre strutture della bocca non devono essere sacrificati alla leggera. In considerazione dell'importanza della vista, tuttavia, il dentista deve essere preparato a formulare un giudizio più radicale che d'abitudine enlla eliminazione di possibili foci infettivi.

L'autore suggerisce anche 1) che tutti i denti con lesioni periapicali devono essere estratti o sottoposti alla cura del canale secondo i casi; 2) che tutte le radici residue e le zone d'infezione residua devono essere asportate.

CONCLUSOES

1. Todos os pacientes com moléstia ocular, independentemente da possibilidade de um foco de infecção dental devem sofrer um exame dental completo.
2. Se êsse exame revelar moléstia dental, com focos de infecção, êles devem ser eliminados para bem estar geral do paciente.
3. Depois de extenso exame e tratamento otolaringológico, um paciente, cuja moléstia ocular não responder a outras formas de terapia, deve ser enviado a um cirurgião oral para consulta e exame dental.
4. Deve ser responsabilidade do dentista, em colaboração com o oftalmologista, determinar até onde possível quais os focos reais ou potenciais de infecção.

Os dentes ou outras estruturas orais não devem ser sacrificados sem maiores exames. Em consideração à importância da visão, entretanto, o dentista deve estar preparado para executar mais do que uma simples eliminação de possíveis focos de infecção.

O autor também sugere (1) que todos os dentes que apresentem moléstia periapical que não a cementoma devem ser extraidos ou sujeitos à terapia do canal da raiz conforme fôr indicado em cada caso individual, e (2) que tôdas as raizes e áreas de infecção residual devem ser excisadas.

REFERENCES

1. An Evaluation of the Effect of Dental Foci of Infection on Health, J.A.D.A. 42:610-697 (June) 1951.
2. Reiman, H. A., and Havens, W. P.: Focal Infection and Systemic Disease: A Critical Appraisal, J.A.M.A. 114:1 (Jan. 6) 1940.
3. Hunter, W.: The Role of Sepsis and of Antisepsis in Medicine, Lancet 1:79 (Jan. 14) 1941.
4. Billings, F.: Focal Infection (Lane Medical Lecture). New York: D. Appleton & Co., 1918.
5. Burket, L. W.: Recent Studies Relating to Periapical Infection, Including Data Obtained from Human Necropsy Studies, J.A.D.A. and Dont. Cosmos 25:260 (Feb.) 1938.
6. Morse, F. W. Jr., and Yates, M. F.: Follow-up Studies of Root Filled Teeth in Relation to Bacteriologic Findings, J.A.D.A. 28:956 (June) 1941.
7. Sommer, R. F., and Crowley, M. C.: Bacteriologic Verification of Roentgenographic Find-

ings in Pulp Involved Teeth, J.A.D.A. 27:723 (May) 1940.
8. Hayes, R. L.: Clinical and Bacteriological Study of 340 Pulp Therapy Cases, J. Dent. Research 22:301 (Aug.) [illegible]
9. Ostrander, F. D.; [illegible] son, J.: A Clinical Stu[illegible] Canal and Periapical [illegible], J. Dent. Research 26:403 (Dec.) 1947.
10. Ostrander, F. D., and Crowley, M. C.: The Effectiveness of Clinical Treatment of Pulp-Involved Teeth as Determined by Bacteriological Methods, J. Endodontia 3:6 (Jan.) 1948.
11. Murray, M., and Moosnick, F.: Incidence of Bacteremia in Patients with Dental Disease, J. Lab. & Clin. Med. 26:801 (Feb.) 1941.
12. Okell, C. C., and Elliot, S. D.: Bacteraemia and Oral Sepsis with Special Reference to Etiology of Subacute Endocarditis, Lancet 2:869 (Oct. 19) 1935.
13. Richards, J. H.: Bacteremia Following Irritation of Foci of Infection, J.A.M.A. 99:1496 (Oct. 29) 1932. Round, H.; Kirkpatrick, H. J. R., and Hails, C. G.: Further Investigations on Bacteriological Infections of the Mouth, Proc. Roy. Soc. Med. 29:1552 (Oct.) 1936.

Lavoisier . . . was a wealthy man, and his property was coveted by the revolutionary triumvirate. He was arrested, charged with the ridiculous accusation of having adulterated tobacco with water and various harmful ingredients which injured the health of the citizens, tried before the Revolutionary Tribunal, and sentenced to death. A courageous citizen, M. Hallé, pleaded for his life before the Tribunal, detailing his services to his country and his achievements in science, but the Tribunal answered that "the Republic has no need of scientists (*la République n'a pas besoin de savants*)," and on the following day Lavoisier perished on the scaffold.

Thus perished Lavoisier, the man who showed that combustion is a union of oxygen with the substance burned, and that the processes of life are such combustions or oxidations. The night of his execution, his friend Lagrange whispered to a comrade: "It took but an instant to cut off his head; a hundred years will not suffice to produce one like it." His love and interest for science were shown in his last request, when he asked that his execution be postponed a few days so that he might see the results of some experiments he had planned, which were being carried on during his confinement. But this slight satisfaction was denied him.

—*Major*

Otorhinolaryngologic Surgery

Technical Problems in the Surgical Treatment of Otosclerosis

GEORGE E. SHAMBAUGH JR., M.D., F.I.C.S.

CHICAGO, ILLINOIS

IN the surgical treatment of otosclerosis certain unusual technical problems have been encountered in relation to anatomic peculiarities of the structures involved. Although these operations are confined to a tiny and highly specialized area of the human body, the problems encountered and their solutions may have a much wider application to other fields of surgery.

Otosclerosis is the most common cause of handicapping progressive deafness in the most productive years of adult life. The otosclerotic lesion consists of a tiny focus of spongy new bone at the oval window of the labyrinth. As this area of new bone becomes enlarged, it slowly invades the oval window and the stapes footplate, gradually fixing the latter until a solid bony ankylosis effectively blocks the passage of air-borne sound to the cochlea and the auditory nerve.

The mechanical obstruction to sound conduction imposed by the otosclerotic process lends itself to mechanical surgical correction. In the early stages of otosclerosis it is possible to break the first trabeculae of new bone by direct manipulation of the stapes, thus restoring good hearing at least temporarily. This is the recently publicized but still experimental stapes mobilization operation.[1] Later, as the otosclerotic bone advances and replaces the oval window and the stapes footplate with a solid mass of new bone, mobilization of the stapes is no longer possible, and to restore hearing a new window (fenestra) must be made in the bony capsule of the labyrinth.[2]

An early and pressing problem in the surgical therapy of otosclerosis was prevention of wound infection. Since the perilymph within the labyrinth is directly continuous with the cerebrospinal fluid, infection easily results in meningitis. Both fenestration and stapes mobilization were first attempted more than fifty years ago, and each was abandoned for the same reason—frequent infection and, in several cases, fatal meningitis. It is significant that the problem of preventing wound infection was solved effectively *before* the advent of sulfonamides and antibiotics. It was solved by applying to these operations the scrupulous aseptic technic of the neurosurgeon, both in operating and in applying the postoperative dressings. With this flawless sterile technic, fenestration has become one of the safest of surgical procedures. Not a single fatality, and not a single serious complication due to wound

---

Read at the Mid-Atlantic Regional Meeting of the United States Section, International College of Surgeons, White Sulphur Springs, Virginia, Feb. 12-15, 1956.

From the Department of Otolaryngology, Northwestern University, and the Tissue Culture Laboratory of Prof. Pomerat, University of Texas, Medical Branch.

Supported by the Office of Naval Research Contract No. Nonr-1598 (01), administered by C. M. Pomerat.

Submitted for publication April 3, 1956.

infection has occurred in more than 4,000 of these operations at the Chicago Wesley Memorial Hospital of Northwestern University during sixteen years. It should not be necessary to reemphasize the fact that *antibiotics are no substitute for a careful aseptic technic.*

The minute size and unusual delicacy of the structures encountered in operating for otosclerosis have necessitated the development of adequate magnification. Thus, the stapes is the smallest bone of the skeleton, measuring less than ¼ inch (6 cm.) in its largest dimension. The completed fenestra measures no more *than 1 mm. wide by 3 or 4 mm. long, and* within it the exposed endolymphatic labyrinth, resembling a spider's web in thickness, is scarcely visible to the naked eye. Although we at Northwestern University may have been the first to employ the operating microscope for mobilization of the stapes and one-stage fenestration,[3] we cannot claim priority, since Holmgren[4] used the microscope for the surgical treatment of otosclerosis nearly thirty years earlier, and of course magnification with the loupe has long been used by the ophthalmic surgeon, as has the colposcope by the gynecologist. There is now available a new Zeiss operating microscope with a built-in light source, variable magnification from 6 to 40 times and a very great working distance, ideally suited for the surgeon who operates for otosclerosis, and possibly for those in other fields of surgery when precise manipulation of small structures is required.

A major and, for some time, an insur*mountable obstacle to successful fenestra*tion was the tendency toward ostogenic closure of the new window as healing proceeded. Many methods were tried to keep the window open, including the insertion of plastic or metal *obturators or the im*plantation of fat, fascia or cartilage;[5] but almost invariably, in the early days, osteogenesis would close the fenestra [illegible]

the patient of his restored hearing. The final solution to this problem was reached when extensive laboratory studies on the experimental animal began to clarify six factors that influence new bone formation at the fenestra.[6] These are as follows:

1. It has long been known that bone fragments are powerful stimulants to osteogenesis. My associates and I have observed that even fine particles of bone dust have this property, probably chemical. The need was to create a fenestra immaculately clean and free of any microscopic particles of bone dust. The solution was found in a simple irrigating device to *maintain a continuous flow of sterile* Ringer's solution during creation of the fenestra with the fine dental burr. This simple addition had a greater influence on our percentage of postoperative closures than did any other improvement in technic.

2. The labyrinthine capsule has a unique bony structure comprising three distinct layers: an outer layer of periosteal bone possessing all the properties of periosteal bone elsewhere, including prompt osteogenic response to trauma; a middle layer of primitive endochondral bone with extremely poor and sluggish osteogenic response to trauma, and a very thin inner endosteal layer. By wide removal of the periosteal layer (far beyond the margins of the completed fenestra) one may take full advantage of the poor osteogenic response of the endochondral bone. This bone is easily identified through the operating microscope.

3. Skin applied closely to bone inhibits *osteogenesis. The first successful fenes*tration operations with permanent improvement in hearing were performed by Sourdille in France about thirty years ago. when he began to cover the fenestra with *a thin plastic skin flap. The Sourdille* plastic [illegible]

4. F [illegible] on-strate th

lines the labyrinth acts as a limiting membrane to new bone formation. Strip or injure the endosteum, and fibrous tissue, followed by new bone, springs up from the denuded wall of the labyrinth. By preserving the intact endosteum up to the sharp edge of the fenestra, where it will unite with the periosteum of the skin flap, healing of the cut bone surface "by first intention" is secured, with a minimum of callus formation. At this point it should be mentioned that endosteum and periosteum are not themselves osteogenic; rather, they act as limiting membranes against the osteogenically active outer cambium layer of bone.

5. A smooth polished bone surface appears to be osteogenically less active than an uneven surface.

6. Young fibrous tissue adjacent to bone is one of the strongest promoters of new bone formation. Thus anything inducing fibrosis, such as a blood clot, a low grade infection or an injury to the endosteal membrane, must be avoided.

The application of these six factors to fenestration has reduced failure due to closure to a comparative rarity. In a recent analysis of 2,000 fenestrations at Northwestern University during seven years there were 17 probable closures, an incidence of slightly under 1 per cent.[7]

There remains, however, a difficult, baffling and as yet unsolved problem of fenestration; postoperative serous (sterile) labyrinthitis. This inflammatory reaction of the labyrinthine contents varies in severity from mild, fleeting postoperative vertigo and nystagmus to severe depression in cochlear function. It may result in fibrosis within the labyrinth, impeding the passage of sound, or in irreversible damage to the sensory hair cells in the cochlea.[8]

Histologic studies of fixed stained preparations from experimental animals recently fenestrated suggest that, in some cases, hemorrhage into the fenestra contributes to the inflammatory reaction; in others, inflammation of the plastic skin flap covering the fenestra, with exudation into the labyrinth, is a factor. The utmost care to obtain perfect hemostasis and the use of elastic sponge packing against the flap to reduce edema and inflammatory reaction have somewhat reduced, but have not eliminated, the failures due to serous labyrinthitis, which today still account for about 5 per cent of failures in fenestration.

Since the study of orthodox histologic preparations of fixed tissues has failed to solve this problem, my associates and I have turned to the tissue culture laboratory for study of living cells from the labyrinth *in vitro.*

Cultures were grown from the organ of Corti and from the middle ear mucosa of the cat. In one set of experiments the actively growing living cochlear epithelium was placed in the perfusion chamber developed in Dr. Pomerat's laboratory, and the effect on the living cells of solutions of various electrolyte content was observed by means of time-lapse cinematographic procedure with phase contrast lighting. In another set of experiments epithelium from the middle ear was used for similar studies. The effect on the cells of perfusion with physiologic solution of sodium chloride, Ringer's solution and the balanced salt solution of Gey was observed and recorded. The preliminary results appear highly significant, not only for operations within the labyrinth but for many procedures in other fields:

1. So-called "normal physiologic solution of sodium chloride is anything but physiologic for living cells *in vitro,* producing, after an hour's perfusion, severe and irreversible cellular damage, with death of the majority of cells.

2. Definitely less lethal but still somewhat damaging, with death of scattered cells, is perfusion with Ringer's solution for one hour.

3. Less damaging, with recovery of

practically all cells, is perfusion with the balanced salt solution of Gey.

The lesson to be drawn from these preliminary studies seems clear; irrigation of living tissues with normal saline physiologic solution of sodium chloride for as long as one hour inflicts at least superficial cell damage. In surgical procedures involving cavities lined by a delicate endothelium or epithelium, such as the labyrinth, the middle ear, and the pleural or peritoneal cavity, this solution may cause denudation of large areas, permitting fibroplastic proliferation and subsequent adhesions. Ringer's solution is much to be preferred for prolonged contact with living tissue, but best of all is a balanced salt solution, such as Gey's, which has been found amicable to living cells in tissue culture work.

Further exploration of the effect of these and other electrolytic solutions on living cells *in vitro* and *in vivo* are indicated. Meantime, I am hoping to interest pharmaceutical manufacturers in making available to the surgeon, at a reasonable cost, sterile solutions more truly physiologic to living tissue than either "normal saline" or Ringer's solution

SUMMARY

Preliminary studies of surgical technical problems in the treatment of otosclerosis are presented. The author emphasizes the fact that the use of antibiotics, however advantageous, cannot serve as a substitute for a careful aseptic technic. Good magnification is also necessary, owing to the smallness of the structures within the ear.

The means of preventing osteogenic closure after a successful fenestration are discussed, as is a problem not yet wholly solved: the prevention of postoperative serous (sterile) labyrinthitis. The author does not recommend perfusion with physiologic solution of sodium chloride, which, in an experiment with living cells *in vitro*, caused death of the majority of cells within an hour. Ringer's solution is preferable for prolonged contact with human tissue, but still better is a balanced salt solution, such as Gey's. Further studies of the effects of various electrolytic solutions are indicated.

RIASSUNTO

Vengono descritti gli studi preliminari nella cura chirurgica dell'otosclerosi. L'autore sottolinea il fatto che l'impiego degli antibiotici, benchè vantaggioso, non può sostituire una tecnica accurata nell'asepsi. E' anche necessario un buon ingrandimento, in considerazione della piccolezza delle strutture dell'orecchio. Vengono discussi i metodi necessari per impedire la chiusura osteogenica dopo una fenestrazione corretta; questo problema non è ancora stato risolto appieno, come pure quello della prevenzione della labirintite sierosa (sterile) postoperatoria. L'autore è contrario all'uso delle perfusioni con soluzione clorurata fisiologica, che può causare, come egli stesso ha dimostrato in vitro, la morte della maggior parte delle cellule nel giro di un'ora. E' preferibile la soluzione di Ringer, e ancor meglio una soluzione salina bilanciata come quella di Gey.

RÉSUMÉ

L'auteur présente une tude préliminaire des problèmes techniques du traitement chirurgical de l'otosclérose. Il souligne le fait que les antibiotiques ne peuvent en aucun cas se substituer à un traitement chirurgical aseptique prudent. De plus, un fort grossissement est nécessaire, du fait de la finesse des structures de l'oreille interne.

L'auteur discute
de prévenir une f
après une fénestratio
la révçntir

ératoire séreuse (stérile) est un problème non encore entièrement résolu. Il déconseille la perfusion au moyen d'une solution de chlorure de sodium qui, lors d'expériences sur des cellules vivantes *in vitro*, a détruit la majorité des cellules dans l'espace d'une heure. La solution de Ringer est préférable pour un contact prolongé avec du tissu humain, mais une solution saline, équilibrée, telle que la solution de Gey, est encore supérieure.—L'auteur indique aussi des effets de différentes solutions électrolytiques.

SUMARIO

Estudos preliminares dos problemas técnicos cirúrgicos no tratamento da otoesclerose são apresentados. O autor chama a atenção para o fato de que o uso de antibióticos, por mais vantajoso que seja, no pode servir de substituto a uma técnica asséptica cuidadosa. A bôa ampliação é também necassária, devido ao pequeno tamanho das estruturas de dentro da orelha.

Os meios para se prevenir o fechamento osteogênico após uma fenestração bem sucedida são discutidos, uma vez que constitui problema ainda não totalmente resolvido: a prevenção de labirintite serosa (estéril) pós-operatória. O autor não recomenda a perfusão com solução de cloreto de sódio, que, em uma experiência com células vivas *in vitro*, causou a morte da maioria das células no espaço de uma hora. A solução de Ringer é preferível no contato prolongado com o tecido humano, mas ainda melhor é uma solução balanceada de sal, tal como a de Gey. Estudos posteriores dos efeitos das várias soluções eletrolíticas são indicados.

SCHLUSSFOLGERUNGEN

Es liegt ein vorläufiger Bericht über die Untersuchung bei der Behandlung der Otosklerose auftretender technischer chirurgischer Probleme vor. Der Verfasser betont, dass die Antibiotika, so nützlich wie sie sind, nicht als Ersatz für eine sorgfältige aseptische Technik dienen können.

Notwendig ist ferner eine gute Vergrösserung der äusserst kleinen Gebilde innerhalb des Ohres.

Es folgt eine Erörterung der Mittel und Wege, einen knöchernen Verschluss im Anschluss an eine erfolgreiche Fensterungsoperation zu verhüten, sowie eines noch nicht völlig gelösten Problems, der Vorbeugung des Auftretens einer (sterilen) serösen postoperativen Labyrinthitis. Der Verfasser empfiehlt nicht die Durchspülung mit physiologischer Kochsalzlösung, die in Versuchen mit lebenden Zellen *in vitro* innerhalb einer Stunde den Tod der Mehrzahl der Zellen hervorrief. Die Ringersche Lösung ist für einen zeitlich ausgedehnten Kontakt mit menschlichem Gewebe vorzuziehen; noch besser eignet sich aber eine balancierte Salzlösung wie die von Gey. Weitere Untersuchungen der Wirkungen verschiedener Elektrolytlösungen sind erforderlich.

REFERENCES

1. Rosen, S.: Mobilization of the Stapes to Restore Hearing in Otosclerosis, New York J. Med. 53:2650-2653, 1953.
2. Lempert, J.: Improvement of Hearing in Otosclerosis: A New One-Stage Surgical Technic, Arch. Otol. 28:42, 1938.
3. Shambaugh, G. E. Jr.: A Modified Fenestration Technic: Analysis of Results in One Hundred and Forty-one Consecutive Operations, Arch. Otol. 36:23, 1942.
4. Holmgren, G.: Zur Chirurgie der Otosklerose, Acta Otol. 15:7,1931.
5. Engstrom, H.: Uber das Vorkommen der Otosklerose, nebst experimentellen studien uber chirurgische behandlung der Krankheit, Acta Otol. Suppl. 43, 1940.
6. Shambaugh, G. E. Jr.: Fenestration Operation for Otosclerosis: Experimental Investigation and Clinical Observations in 2,100 Operations in a Period of Ten Years, Acta Otol. Suppl. 79, 1950.
7. Shambaugh, G. E. Jr.: Causes of Failure in Surgical Fenestration: A Follow-up of 3,000 Consecutive Cases, J. Internat. Coll. Surgeons 19: 104, 1953.
8. Shambaugh, G. E. Jr., and Takahara, S.: A Clinical and Experimental Study of the Effect of Fenestration on the Labyrinthine Contents, Acta Otol. Suppl. 123, 1955.

Tumors of the Nose and Paranasal Sinuses

ARTHUR L. RATKO, M.D.
CHICAGO, ILLINOIS

MALIGNANT disease in the areas to be discussed here has long been relegated to a sort of no-man's-land in current diagnostic and therapeutic regimes. There are several reasons for this, of which these are three: (1) failure to recognize important clinical evidence of the presence of malignant change until it is far advanced; (2) hesitation to carry out adequate therapy because of the ill-founded fear of mutilation, and (3) lack of a systematic approach to evaluation and treatment.

I would like to present a somewhat limited review of the salient features of diagnosis and treatment of these neoplasms.

Diagnosis. — A. *Symptoms:* Although no stereotyping of the pattern or order of appearance of the symptoms is possible, they do fall into two rather definite *groups, early and late.*

The early symptoms are as follows:

1. *Hypesthesia over one or more* branches of the trigeminal nerve. The patient may complain that his face feels "dead."
2. Aberrant, trigger-like pain in the same areas.
3. "Fullness" in the cheek or eye.
4. Progressive nasal obstruction, usually unilateral.
5. "Toothache" in the upper jaw.

Later the following symptoms may appear:

1. Generalized hemifacial or hemicranial pain.
2. Unilateral epistaxis.
3. External deformity.
4. *Dysfunction of the cranial nerve:* (a) corneal anesthesia; (b) extraocular muscle paresis or paralysis; (c) diminished visual fields or visual acuity.

It must be realized that constant vigilance and constant suspicion of such symptoms, particularly when progressive, will discipline the practitioner's thinking so that he may more readily recognize the earlier symptoms.

B. *Examination:* The details of a routine examination are too well known to require elaboration, but I should like to point out several details that one might overlook in the course of a busy day. Frequently, a nasopharyngoscopic examina*tion will clearly demonstrate a nasal lesion* one might otherwise overlook. Recent work has demonstrated the value of cytologic study of sinus washings in detecting nonvisible lesions. The importance of a biopsy cannot be stressed too greatly. Less frequently, the creation of an exploratory antrum window or a Caldwell-Luc procedure will demonstrate a lesion that cannot be detected in any other manner.

C. *Roentgen Study:* In most cases, routine sinus projections are sufficient to demonstrate sinus "clouding" or masses, as well as bony erosion. If these do not give sufficient information, the use of contrast media, as well as laminographic studies, may be in order. I have found it imperative to take basilar views of the skull as well as thoracic ro[illegible]ms in all cases before carrying [illegible]e therapy.

In [illegible]
factors [illegible]

Read at the Twentieth Annual Congress of the United States and Canadian Sections, International College of Surgeons, Philadelphia, Sept. 12-15, 1955.
Submitted for publication March 9, 1956.

in the evaluation of any of the aforementioned complaints. One cannot emphasize too strongly the need for a comprehensive approach, rather than reliance on isolated or seemingly unrelated symptoms or signs. The prognosis is often in direct proportion to the intensity of the investigation and the keenness of the investigator's suspicion.

D. *Histopathologic Study:* While it is true that many lesions of this type do not present easily accessible tissue for biopsy, this is no excuse for failure to obtain one when the presence of such a lesion is suspected. Often the biopsy is a simple office procedure, but one should be prepared to handle the rather brisk hemorrhage that may ensue. One must avoid the pitfall of a "negative" biopsy in a patient who has a clinically demonstrable neoplasm. Either such a biopsy is inadequate, and should be repeated, or tissue with inflammation secondary to the neoplasm is obtained. Not infrequently I have prepared a patient for an operation entirely adequate on the basis of clinical observations and performed an exploratory procedure with frozen section before proceeding with the more extensive operation.

Generally speaking, approximately 80 per cent of these lesions are epithelial in origin. The squamous or epidermoid types are most common, the more anaplastic or adenocarcinomatous types being in the minority. Even less frequently one encounters cylindroma and lesions originating in accessory organs of the skin or mucous membrane. The tumors of connective tissue origin are most frequently fibrosarcomas, neurofibrosarcomas, osteomas and chondromas. This rather general description would suffice for more than 95 per cent of my own cases.

Of particular interest to my associates and me has been a lesion we describe as "inverting papilloma." This lesion has been overlooked all too frequently as a potentially, and occasionally truly, malignant lesion. It has been described in the literature under various terms, such as "papilloma durum," "nasal papilloma" and even "cylindrical-cell carcinoma." We prefer the term "inverting papilloma," since it more accurately describes the true histologic nature of the lesion. Grossly this tumor cannot be differentiated, in most cases, from an ordinary nasal polyp, and this characteristic has lulled the physician into a false sense of security with regard to its true nature. Microscopically, the lesion first appears to be an invagination or "inverting" of the covering epithelium of otherwise polypoid tissue. This inverted epithelium becomes gradually more and more prominent until there is almost complete replacement of the loose stroma by masses, islands and trabeculae of epithelium. For the most part, the basement membrane is intact. Relatively few mitoses are present, and there is relatively little evidence of anaplasia or loss of polarity of the epithelium. Occasionally, however, one may see an increase in the number of mitotic figures and a distinct tendency toward anaplasia, so that one might label the lesion "carcinoma *in situ.*" This lesion extends by expansion and compression of surrounding structures rather than by direct invasion as typically observed in the presence of frank malignant change. My associates and I have come to look upon this lesion as a histologically benign but clinically malignant tumor. Therapy must be vigorous and adequate.

Therapy.—The treatment of these lesions cannot be stereotyped. Each case must be evaluated individually, depending upon the following factors: (1) the histopathologic picture; (2) the location of the tumor; (3) the extent of the tumor; (4) the presence or absence of distant spread, and (5) the general physical condition of the patient. The last factor is important only as to whether or not generalized or systemic pathologic conditions, such as cardiovascular disease, pulmonary disease and the like, if present, are so severe as to contraindicate adequate surgical intervention. An adequate rehabilitation program includes cosmetic rehabilitation, and a possible cosmetic defect, unless irreparable, should be no deterrent to adequate therapy.

A. *Surgical Intervention:* If the study and evaluation of the case indicates that the lesion can be totally removed surgically, this, in my opinion, offers the best prognosis. The operation is performed by the Weber-Ferguson or lateral rhinotomy approach. It must be emphasized that the lesion should be approached from the periphery, care being taken at all times not to break into any tissues that may contain tumor. I prefer the cold knife or chisel in doing the block resection. This is followed by electrofulguration of such structures as the infraorbital plate, the posterior aspect of the cavity created and the lamina papyracea, if the ethmoid labyrinth has been exenterated. If there is any close involvement by tumor of the infraorbital plate, I prepare the patient, in advance of the operation, for exenteration of the orbit as well. It is my conviction that if the infraorbital plate is involved, radiologically or grossly, at the time of operation, preservation of the orbit and its contents will lead to nothing but failure. Too often I have encountered repeated recurrence or evidence of persistence when I attempted to spare an eye despite involvement of the infraorbital plate. Generally speaking, in most cases in which I have operated, I preferred not to use any form of radiation therapy unless there was proof of residual disease or the likelihood of postoperative recurrence. It is my opinion that the likelihood of cure is increasingly greater if *an adequate operation is performed* and followed by either intracavitary radium or radon or external irradiation, or both.

I cannot stress too strongly the importance of carrying out what I prefer to term an "adequate" rather than a "radical" operation. After all, if one fails to operate adequately, the tumor itself will be far more radical than the surgeon can hope to be.

An additional point to be kept in mind: If there is any question of the involvement of *overlying skin or soft tissue, that must* be sacrificed; again I have found that attempting to preserve such soft tissue by "shaving it off" has resulted in nothing but failure. It is my impression that almost any cosmetic defect created by the operation can be corrected either by a plastic surgical procedure or by prosthetic appliances. Subtotal removal of the hard palate permits adequate postoperative inspection of the cavity, and makes possible early visualization of recurrent or residual tumor, as well as intracavitary irradiation. The defect thus created can easily be closed by means of a dental prosthesis with little, if any, functional defect.

B. *Irradiation:* 1. *External Irradiation.* For patients who refuse surgical therapy I have instituted a course of radiation therapy, utilizing multiple ports and a cross-fire technic, that delivers a tumor dose in the vicinity of 6,000 r. In addition to those who refuse operation, I treat by irradiation those of my patients from whom the lesion cannot be surgically removed and those in whose cases there is evidence of intracranial or distant spread of the tumor. In addition, as I have previously stated, I treat some patients by irradiation after they have undergone operation.

2. *Radium or Radon:* If there is any possibility or evidence of tumor that cannot be resected, I invariably use a radium or radon bomb, working in close conjunction with the Radiology Department in estimating the dosage and creating a suitable mold to deliver a cancerocidal dose of gamma radiation to involved areas of the cavity. In my experience, intracavitary radiation h[illegible] valu[illegible] in controlling lo

rent tumor, even when a full dose of external irradiation has been given to the point of skin tolerance.

It can readily be seen that the problem of the best type of therapy is not a simple one. All of my patients are seen by a tumor board consisting of various members of the department, where all the data on an individual patient is available and a thorough discussion of the problem is carried out. A recommendation is then made and therapy administered. Periodically, my associates and I review and occasionally revise our methods in the light of this experience. It is only by utilizing all the modalities of therapy available that we can hope to improve our knowledge of this disease and be enabled to control its many ramifications.

Rehabilitation.—One of the most important aspects of rehabilitation is the proper preparation of the patient for therapy. One should discuss with him, in terms he can clearly understand, what is to be done and what he can expect. He must be assured that not only control of his disease but his eventual rehabilitation and restoration to society will be carried out vigorously. Generally speaking, I have observed that soft tissue defects, such as that caused by loss of a portion of the cheek, can best be closed by a plastic surgical procedure, whereas bony and orbital defects are best obliterated by prosthetic appliances. An excellent temporary replacement for the absent hard palate is a simple temporary dental plate to which a nylon sponge has been fixed by an adhesive. This closes the cavity and allows the patient to eat and talk in as nearly normal a manner as possible until the more elaborate permanent appliance has been constructed. In the immediate postoperative period close supervision and cleansing of the cavity are imperative, and the patient is instructed in the essentials of the hygienic measures that he can carry on at home. Except in the strong likelihood or actual presence of persistent disease for which the patient is being treated, rehabilitation measures should be instituted as soon as possible after the initial therapy. Close follow-up of the patient after therapy is extremely important, not only because it gives him a strong feeling of reassurance but also because it enables the surgeon to detect possible recurrence at an early date, when it can be more easily and successfully irradiated. There is no place in the overall scheme of this department for failure to carry out this most important part of tumor therapy. Generally speaking, the intervals between visits after initial healing range from three to four weeks for the first year up to twice a year at the end of five years. The patient is at all times instructed as to the importance of reporting any unusual symptoms or signs, regardless of the date of his next office appointment. Frequently, these instructions have paid dividends.

CONCLUSIONS

Only by maintaining a high level of suspicion and pursuing even the most insignificant symptoms or signs have we otolaryngologists been able to detect tumors of the nose and the paranasal sinuses in the early stage. An open mind must be maintained at all times with regard to therapy, since all of the methods described at one time or another have a distinct role to play in the overall scheme of treatment. The author does not attempt to stress any particular form of therapy, since in his opinion each contributes to the overall picture.

SCHLUSSFOLGERUNGEN

Nur durch ständige äusserste Wachsamkeit und durch Beobachtung auch der unscheinbarsten Beschwerden und Krankheitszeichen gelingt dem Hals-Nasen-Ohrenarzt die Entdeckung von Geschwülsten der Nase und ihrer Nebenhöhlen im frühen Stadium. Probleme der Behandlung müssen stets unter einem weiten Ge-

sichtswinkel betrachtet werden, da alle beschriebenen therapeutischen Verfahren unter jeweils gegebenen Bedingungen ihren bestimmten Anwendungskreis haben.

Der Verfasser verzichtet auf die Her*vorhebung irgendeines bestimmten* Behandlungsverfahrens, da seiner Meinung nach alle Methoden im gesamten therapeutischen Plan ihre eigene Rolle spielen.

CONCLUSOES

Sómente pela constante suspeita e atenção aos mais insignificantes sintomas e sinais, pudemos nós os otorrinolaringologistas descobrir tumores do nariz e dos seios paranasais no primeiro estágio. É preciso se *conservar sempre alerta em* relação à terapia, uma vez que os métodos descritos aqui e ali desenpenham papel distinto no esquema global do tratamento.

O autor não procura salientar qualquer forma especial de terapia, uma vez que, em sua opinião, cada uma contribui para o quadro geral.

CONCLUSIONI

Noi otoiatri siamo riusciti a diagnosticare i tumori del naso e dei seni paranasali negli stadi più precoci soltanto attraverso l'abitudine al sospetto continuo e alla valutazione dei sintomi più insignificanti. E' necassario mantenere una grande larchezza di vedute in rapporto alla terapia, poichè tutti i metodi proposti fino ad ora riconoscono delle indicazioni particolari. L'autore non ne raccomanda alcuno *in maniera particolare, dacchè ognuno di* essi, secondo lui, può contribuire a risolvere il problema terapeutico.

CONCLUSIONS

C'est seulement grâce à une circonspection constante et grâce à la grande attention que nous, otolaryngologistes, avons accordée aux symptômes et aux signes même les plus insignifiants qu'il nous a été possible de diagnostiquer des tumeurs du nez et des sinus à leur début. Il faut garder un esprit constamment ouvert à l'égard de toutes les possibilités thérapeutiques, car toutes les méthodes décrites jouent, à *un moment ou à un autre,* leur rôle précis dans l'ensemble de la thérapeutique.— C'est pour cette raison que l'auteur ne tente pas de donner la préférence à un mode de traitement plutôt qu'à un autre.

> Probability is the rule of life, especially under the skin. Never make a positive diagnosis.
>
> —*Osler*

Proctologic Surgery

Management of Anal Incontinence

KARL ZIMMERMAN, M.D., F.A.C.S., F.I.C.S.*

PITTSBURGH, PENNSYLVANIA

ANAL incontinence is inability to restrain the passage of discharges through the anal canal. Although some patients compensate well for this disability, many of them cannot tell where or when they may pass gas or soil themselves. This sense of insecurity results in severe psychic trauma, which often makes the patient a social outcast.

The treatment of anal incontinence may be palliative, the patient following a colostomy routine consisting of a constipating diet and a daily enema. This routine is not satisfactory, since an indiscretion in diet or an inflammation or irritation of the intestine causes soiling or uncontrolled passage of gas. Although surgical correction is the only real solution to this problem, it is too often unsuccessful.

Anal incontinence may be congenital or acquired. Congenital incontinence is due to deformities of the hindgut and the proctodeum, with absence of all or part of the anal sphincter, or to defects in development of the spinal column and cord. Spina bifida with myelomeninogocele, with resulting disturbance of the nerve supply to the pelvis, accounts in many cases for incontinence. Several surgical procedures have been devised to correct this type of incontinence, which is due to the absence of a sufficient anal musculature or nerve supply. Several muscle-transplanting operations have been tried, as well as insertion of wire, but have given far from satisfactory results. One of the best known operations is the one popularized by Stone and Katz[1] in which two loops of fascia lata are placed around the anal canal and attached to the gluteus maximus muscles. This operation has been helpful in some cases where the deformity was low, and the nerve supply to the glutei was not impaired. Pickrell and Georgiade of Durham, N. C.,[2] have described a plastic procedure in which the gracilis muscle is used as a new anal sphincter. The nerve supply to this muscle is from the second and third lumbar levels, and the source of most of its blood supply can be preserved. Their method holds some promise in cases of congenital incontinence and seems adaptable to some types of acquired incontinence, especially when there has been low destruction of the nerve supply or when most of the sphincter muscle has been destroyed.

Acquired incontinence may be caused by infection, such as lymphogranuloma venereum or ulcerative colitis. In the case of lymphogranuloma, the normal tissue of the lower portion of the rectum and anal canal is replaced by scar to such an extent that surgical correction of the incontinence is impossible. The patients usually have so much fibrosis that a stricture results and colostomy is required. Incontinence in patients with ulcerative colitis presents a different problem, since incontinence is the result of abscesses and fistulas caused

---

* Assistant Professor of Surgery and Head of the Section of Proctology, University of Pittsburgh School of Medicine.

Read at the Twentieth Annual Congress of the United States and Canadian Sections, International College of Surgeons, Philadelphia, Sept. 12-15, 1955.
Submitted for publication March 30, 1956.

by pus from the rectum and colon, trapped at the pectinate line. Operation on the anal canal of a patient with active colitis should be limited to the incision and drainage of abscesses or fistulas that have filled with pus. Fistulectomy and plastic repair of the sphincters can be attempted in such a patient only during a quiescent stage of the disease.

Patients with fecal impaction are incontinent because of pressure from the impaction and fatigue of the anal muscles. The treatment, of course, is removal of the impaction.

In cases of procidentia, the continued stretching of the anal canal and muscles results in an elongated sphincter muscle that is not able to contract enough to close the canal. Such an elongated muscle is often shortened posteriorly at the same time the procidentia is corrected. If this shortening procedure is not successful *because some of the procidentia persists* after the operation, the insertion of a Thiersch wire is probably the best procedure. Insertion of the wire does not completely restore continence, but it keeps the procidentia in place and helps to hold back the solid and some of the liquid discharge.

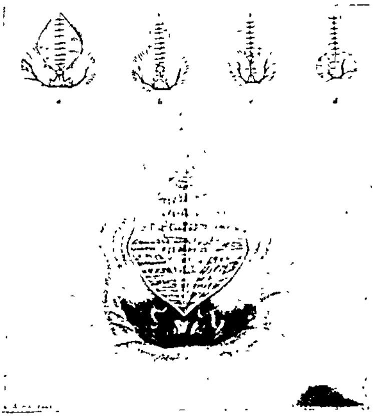
Third degree tears during obstetric procedures cause anal incontinence in many cases. In most of these cases the rents are *repaired by the obstetrician or the gynecologist* who repairs the sphincter muscle at the same time he performs perineorrhaphy.

Accidents resulting in impalement are not uncommon among construction workers and children. The method to be described may be used in this type of injury.

Postoperative incontinence may be due to infection of anal wounds, which de*stroys some of the muscle or causes* so much scar that the muscle cannot function properly. In many cases this condition is also caused by dividing too much of the muscle at the wrong place or in too many places. Sometimes these incisions are necessary for complete eradication of a fistula, and incontinence is unavoidable even when setons are used judiciously.

By far the most common cause of anal incontinence is fistulectomy with the pernicious practice of continued postoperative packing of the wound.

Although the scars observed in these patients with postoperative deformities are irregular and the tissue around them distorted to various degrees, a basic pattern is present in all of them. The original incision or incisions that caused the incontinence started in the anal canal or the lower part of the rectum and extended through the sphincters into the surrounding tissue. Contraction of the sphincter muscles holds the wound apart, making the gap between the muscle ends the widest part of the wound. From this wide portion of the wound, the deformity be*comes narrower as it approaches both its* internal and its external end. This results in a diamond-shaped or kite-shaped deformity that is fairly symmetric, especially



Steps in technic of operation for · tinence.

if the original incision was made at right angles to the sphincter. The two lateral points of the deformity are at the severed ends of the muscle. The internal point is near the level of the pectinate line, or just above it, and the external point is on the buttocks, the perineum or the anal coccygeal raphe. The anal canal loses part or all of its depth in the deformed area. When covered by skin and scar tissue, this area maintains practically the same pattern as that of the original wound.

The incisions made for repair of this deformity are placed so that the resulting wound is similar to the original one. The first incision is made through the skin and most of the scar, from the internal apex of the deformity to a point just above one severed end of the muscle. The second incision connects the same internal point to the tissue above the other severed end of muscle. Two similar incisions connect the muscle ends with the external apex of the deformity. The skin and most of the scar within these incisions is dissected away.

No attempt is made to remove the scar completely. A thin layer of scar is left purposely, as it holds the muscle fibers and fat in place and will allow sutures to be placed through it that will not tear out under tension. Various types of stitches have been devised to put tension on muscle without shredding the fibers or pulling out. Most of them cause strangulation of the muscle and should be avoided. If a thin layer of scar is left over the muscle ends and fat, such sutures are not necessary; the scar will hold both muscle fibers and stitches without tearing or strangling any tissue.

The next stage of the operation is to approximate the two sides of the wound with several layers of interrupted No. 000 chromic sutures. A line from the internal apex of the wound to the external one is the base line above which the rows of sutures are placed. The first suture in each row is placed in the membrane of the lower part of the rectum and the anal canal as the wound is brought together, so that it is not necessary to insert a speculum to suture the anal and rectal membranes after the scar containing the muscle ends has been approximated.

The skin is also closed with No. 000 interrupted chromic catgut, and two or three steel wire retention sutures are inserted deeply. A finger is placed in the anal canal when the steel sutures are inserted to make sure that neither the rectum nor the anal canal is not perforated. Large cutting skin needles with a semicircular cutting edge are used for this procedure. The wire sutures are tied over a roll of gauze about 1.5 cm. in diameter. No other dressing is applied.

Preoperatively these patients are prepared in the same manner as for a resection of the colon with anastomosis. Postoperatively, nothing is given by mouth and intravenous fluids are used for three days; clear liquids taken by mouth are allowed for three days, and then the diet is gradually increased. On the seventh day an enema of 1 pint of plain water is given. This is repeated daily. If the patient feels fullness in the rectum or passes any stool, the enema may be given earlier. The patient is allowed to stand out of bed on the fifth day; he may walk or lie down, but should not sit. Antibiotics are given parenterally for the first five days, then orally until the patient is discharged from the hospital on the twelfth to fourteenth day.

This method has given excellent results in 15 of 17 cases. One patient was only partially benefited, and 1, who became nauseated and began to have diarrhea on the third postoperative day, received no benefit. Two other patients had superficial cutaneous fistulas, which were removed in the office after the wound had healed. Continence was not affected by this procedure in either of these cases.

SUMMARY

A short review of the causes and treatment of anal incontinence is presented. The most frequent cause is fistulectomy followed by continued postoperative packing of the wound. Since the deformity in this type of anal incontinence follows a rather set pattern, a simple method of repair is presented. This technic has been used successfully in 15 of 17 cases.

RÉSUMÉ

Une brève revue des causes et du traitement de l'incontinence anale est présentée. La cause la plus fréquente est la fistulectomie suivie de l'application d'un pansement maintenu en place. Etant donné que l'infirmité en résultant est généralement du même type, l'auteur décrit une technique réparatrice simple, qu'il a utilisée avec succès dans 15 cas dur 17.

ZUSAMMENFASSUNG

Es wird ein kurzer Überblick über die Ursachen und die Behandlung der Inkontinenz des Afters gegeben. Am häufigsten ist eine Fistelresektion mit anschliessender fortgesetzter Tamponierung der Wunde verantwortlich zu machen. Auf Grund der Tatsache, dass die bei dieser Form der Inkontinenz des Afters beobachtete Entstellung ein recht einförmiges Bild darbietet, wird eine einfache Methode zur Wiederherstellung dargestellt. Dises Verfahren wurde in 15 von 17 Fällen mit Erfolg ausgeführt.

RIASSUNTO

Viene presentata una breve lista delle cause e delle cure della incontinenza anale. La causa più frequente è una pregressa fistulectomia seguita da un continuo saffamento della ferita. Poichè in questo tipo di incontinenza si determina una deformità abbastanza caratteristica, viene suggerito un metodo semplice di cura. Questa tecnica è stata eseguita con successo in 15 su 17 casi.

SUMARIO

Uma pequena revisão das causas e tratamento da incontinêcia anal é apresentada. A causa mais frequente é a fistulectomia accompanhada pelo curativo inadequado da ferida. Uma vez que a deformidade nêsse tipo de incontinência anal obedece a um padrão mais ou menos determinado, um simples método de reparo é apresentado. Essa técnica foi usada com sucesso em 15 de 17 casos.

REFERENCES

1. State, D., and Katz, A.: The Use of Superficial Transverse Perineal Muscles in the Treatment of Post Surgical Anal Incontinence, Ann. Surg. 142:262, 1956.

2. Pickrell, K. L., and Georgiade, N.: Gracilis Transplant Operation to Restore Rectal Continence. Read at a meeting of the American Proctologic Society Meeting, New York, June 1955.

ADDITIONAL SOURCES

Birnbaum, W.: A Method of Repair for a Common Type of Traumatic Incontinence of the Anal Sphincter, Surg., Gynec. & Obst. 87:716, 1948.

Blaisdell, P. C.: Repair of Incontinent Sphincter Ani, Surg., Gynec. & Obst. 70:692, 1940.

Buie, L. A.: Practical Proctology. Philadelphia: The W. B. Saunders Company, 1938, p. 160.

Fansler, W. A.: Repair of Incontinence Following Operation for Fistula, South. M. J. 45:229, 1952.

Fansler, W. A., and Neumeister, C. A.: Treatment of Incontinence and Other Abnormalities Following Infections of the Anal and Rectal Regions, Am. J. Surg. 821:88, 1954.

Kallet, H. I.: Anal Sphincter Repair, J. Internat. Coll. Surgeons 10:420, 1947.

Knopp, L. M.: Plastic Repair for Postoperative Anal Incontinence, Ann. Surg. 109:146, 1939.

Rosser, C.: Surgical Repair of Incontinent Anal Canal, South. M. J. 41:882, 1948.

Smiley, K. E.: Repair of Sphincter Ani with Alloy Steel Sutures, Tr. Am. Proct. Soc. 11:191, 1940.

Stone, H. B., and McLanahan, S.: Results with Fascia Plastic Operation for Anal [illegible]tinence, Ann. Surg. 114-73, 1941.

Turrell, R.: Plastic Repair fo Anal Incontinence, Am. J. Surg.

Editorials

Perception and Prophecy

IT is a common experience with me, as with anyone who spends much time with books, to find again and again, often on a page turned yellow with time, a phrase, a sentence, a paragraph or an entire anecdote as fresh and apposite as though it had been written yesterday. Sometimes, indeed, the whole book is permanently topical, as witness *Robinson Crusoe, Don Quixote, The Pilgram's Progress* and many of the plays of Shakespeare. Such works serve to orient the reader in the centuries of man's history; to readjust the lenses, so to speak, through which he views the modern world, and to lift his perception to a point of vantage from which he is able to see that time, space and alterations of custom have little to do with human nature and human needs, which are always and forever the same. One thinks of the authors thereof as poets and prophets, and so they are in a sense; they have prophesied, in terms so universally applicable as to bear the stamp of inspiration, the endless continuity of that greatest of all adventures, human life.

An almost equally common experience is the sense of foreknowledge of wholly unfamiliar persons and places—the sense that finds expression in the words "I have been here before." The feeling, amounting almost to certainty, cannot be denied, whatever fantastic theories may be devised to explain it.

Less common, perhaps, though by no means unusual, is the projection of aspiration and desire into certainty of what the future must hold. We encounter, perhaps, an old friend lost to sight for a score of years or longer, and he says, "Remember what you told me that winter night by the fire, about what was going to happen to me and my plans? I didn't believe it, but I'm blest if it wasn't true from beginning to end. How did you know?"

We don't know how we knew, but we certainly did. Revelation? Inspiration? These are spacious words to be tossed about lightly. We hasten to disclaim, for modesty's sake, any title to either of them, and murmur something about "accident" or "coincidence." Neither of these can accuse us of self-importance, for over accident and coincidence we have no control.

Safe terms, undoubtedly. But are they the right ones? Is it not more probable that such prevision is rooted in that area of man's capacities—undoubtedly a vast one—that has not yet been explored? Is it not at least conceivable that each of us bears within himself the seeds of a knowledge which, when it suddenly bursts into bloom, we acclaim as genius?

These are high and hopeful speculations, and there is as yet no witness to their truth. There is plenty of witness, however, to an accessory fact: that when the "spirit of prophecy" descends upon a man and the prophecy comes true, it is invariably concerned with an idea or a principle infinitely above and beyond the man himself.

I have had the experience, within the past few days, of finding myself once more a "prophet unawares." Turning through some old manuscripts, some of them my own, some of them written by others, I came across an address I delivered in 1939 at an International Assembly of the International College of Surgeons in New York. This is what I said:

"The watchword of our society is *internationality* and *interfraternity.* From all nations our group is selected. We stand as crusaders for all mankind and for all men. For ages, suffering humanity has appealed for relief. The first plea goes to God and to His ministers on earth, and the second rises to His mortal dispensers of mercy, members of the medical and surgical professions. After all, it is *mercy* that makes kin the *visible* and the *invisible* worlds. Mercy is the Infinite's great common denominator of the universe. The great mortal common denominator is that most marvelous of all machines, the human body. The mechanicians who keep it functioning and in repair are we, ourselves, the sons of Aesculapius. Ours is the human key to that most precious living possession, as cited in the words of the Apostle Paul: 'Skin for skin: All that a man hath will he give for his life.'

"Now, because of this power vested so sacredly in our venerated profession, scientists must work as one, without barrier, as aptly exemplified in the aphorism of Pasteur we have adopted: *La science n'a pas de patrie parce que le savior est le patrimonie de l'humanité, le flambeau qui éclaire le monde.* The words and thoughts of the great Pasteur have been significantly augmented bv our excellent International President, Dr. Crottí. There, in substance, is outlined our credo.

"We must share experiences, discoveries and all research for the sake of science and mankind. For science should be shared mutually and freely with her acolytes as the Infinite Power possesses in common with the finite world the air, the sun and the other elemental attributes of the universe. If we fail in this mutuality, then we fail as scientists.

"Suffering is the common lot. Equally common should be the palliations or the panacea. as one by one science unfolds the ways and means to palliation or cure.

"Man is not made to live alone, nor are races created to dwell in proud, narrow and selfish splendor. Barriers hindering surgical progress must be removed from all scientific endeavors before the world can fulfil its destined place in the universe. Achievement is *of the world, in its entirety.* And so achievement can recognize no limits. It requires organizations such as our International College of Surgeons to blaze the trail for the humanities, working together for the common good; and the good of all humanity means the exchanging of ideas and methods, and ways and means from such groups as ours—and establishes, too, a nucleus from which will sprout and flourish the acme of mortal benefits.

"Every surgeon worthy of the name counts as his greatest recompense not his monetary reward—though even a surgeon must live—but the knowledge that he has alleviated suffering, rebuilt an injured body, and kindled anew in the heart of another human being the fires of hope and courage, and often happiness.

"All nature is cooperative and correlative. In the destiny of the whole, even the most destructive of nature's forces play a great part; and science is, at once, nature's handmaid and *her master!* As scientists, we are bound together as one body. We must recognize that fact. We are one in science as the body is one in the flesh. Do we not ply our art and science on Himalayan mountain tops? On the shores of the Yangtse-Kiang? At the foot of Fuji-Yama? In the shadow of the Seven Hills and the echo of the bells of Rome? Or where the chimes of Big Ben cut through the fogs of London? In the glow of the midnight suns of Norway, Sweden, Greenland, Alaska or the chill Arctic and Antarctic regions? Or the cinders of the smoking shambles, plains and mountains that were once haughty Spain? In the slums of Paris? Or on Unter den Linden of Berlin? By the griefs of Palestine? The renaissance of Turkey? The classic ghosts of Greece? Of the Andes? In the huts or castles of Mexico? Or the isolation of scattered islands? The shadow of Egypt's past? Or the aroma of Brazilian coffee fields or Argentinian natural beauties? *No matter where we work, ours is the common bond.* Because of this common bondage we sons of Aesculapius must strengthen our bonds of relationship, just as the heart keeps the blood circulating in the body from head to foot. We must take our idea of cooperation from that human body that we serve in the name of science.

"Eventually, our society will stand as a unit of scientific perfection and power because of its unselfish, self-sacrificing, fraternal and mutual labors toward the glory of human endeavor for humanity's sake.

"When we have thus constituted our society and ourselves into a mighty machine of mercy and learning, freely disbursed, from it may eventuate such a leverage of health and hope and welfare that all the peoples of the world will lay their laurels at the pedestal of our endeavors. Like the waters we drink, the air we breathe and the earth we tread, so are the science and the art of the surgeon a real and a sacred gift from the Infinite. Since this is so, this great gift must be used, in so nearly as finite men can humbly imitate the Infinite, in a style and manner patterned after the generosity and the patience with which the universe is surrounded and from which it was built.

"Gentlemen, let me quote from 'Ye Weary Wayfarer':

'Life is mostly froth and bubble,
Two things stand like stone:
Kindness in another's trouble,
Courage in our own!' "

In the years since 1939, has not the sense of man's desperate needs of unification on the main issues of life grown to colossal proportions? Has not the role now being played and the role to be played in the future by physicians and surgeons not been written and the role of "supermen" and "master races" written off? Has not the high conception of the brotherhood of all men, based on the suffering which is their common lot and the needs of body, mind and spirit common to all, gained ground throughout the world? Last but not least, is not the International College of Surgeons today a living proof of the prophecy I ventured? ". . . Our society will stand as a unit of scientific perfection and power because of its unselfish, self-sacrificing, fraternal and mutual labors toward the glory of human endeavor for humanity's sake."

It does so stand, and on a deep foundation. It has been assailed again and again, to borrow an ecclesiastical phrase, by all the winds of organizational doctrine. In vain; it is built upon the bedrock of principle, not upon the drifting sands of empty theory and personal aggrandizement. The opportunity which gave it birth was an opportunity to serve and sustain mankind, and the alien word "opportunism" is not in the College vocabulary. Nor will it gain access thereto in the future, whatever the future may hold—if only because the joy of selfless service is a thousandfold more satisfying to any decent man than the base coin with which the opportunist is paid for his soul.

M. T.

Timely Reflections*

GANDHI said that Truth is an exclusive property of no single scripture. To the medical profession of the world, we would like to add the reminder that Science is the exclusive property of no single race, color or creed. The torch of man's scientific knowledge may illuminate the dimly lit caverns of his ignorance or light his way to eternity in the mushroom cloud of atomic fission. This light is not hostile to the precepts of religious faith but rather to the ignorance of superstition, the conception of pain as punishment, of suffering as inevitable and of life as cheap and expendable. Self-determination is not a gift but an inherent right of man, be it to govern himself or to annihilate himself; to learn and so to live, or to close his mind to the advances of science and so to die before his time.

History is not the codex rescriptus. Its pages are permanently stained by man's inhumanity to man, from the ravages of

---

*Adapted from an article originally presented in Bombay, India.

Ghengis Khan, the rape of the Sabines and the autos-de-fe to the blotches of gas chambers in the modern Dark Age. It would be comic, were it not so tragic, to see man hold himself aloof by his fears and his hatreds, as self-appointed God over the various minorities. There are no second-class citizens. Only immature minds perpetuate the myths of a superman or a super-race. In a free society man is inviolable in both body and mind, and the integrity of both must be insured against the onslaught of his fellow men, not only individually but collectively, e.g., by an all-powerful State. Medicine has passed through many phases, from the human sacrifice on the altar of the ancient temple to the self-sacrifice of the epidemiologist and back again to the human sacrifices in the concentration camp. Ethics and morals allow no place for the subservience of man, and there is no place in the human race or in the ranks of the medical profession for the inhuman experimenter. Emergence from this second Dark Age may well depend upon the rededication of men of science in general, and physicians and surgeons in particular, to the principles of humanitarianism, the preservation and protection of life wherever it exists, and, where it merely exists, the promise of a more healthful and, therefore, a fuller life. Life, for which there is no substitute, is the essence; faith is its beacon, and science must be its protector.

The dissemination of information, knowledge and science for the common good, as epitomized by the *Journal of the International College of Surgeons,* is a major factor in eliminating man's myopic and egocentric concentration on the problems of his own plot of ground. The search for truth must transcend local prejudices, and we ask that man respect the dignity of his fellow man, whoever or wherever he may be. Do unto others as you would have them do unto you.

ARNOLD S. CHAMOVE,
M.D., F.I.C.S.
San Francisco, California

The quarrel between the barber surgeons and the apothecaries of England, despite the stocks, continued with unabated bitterness until 1540. In this year the barbers, by a degree of influence which had not been accorded the apothecaries, managed to be heard at court, and their spokesman succeeded in favorably interesting King Henry VIII. A charter was proposed, setting forth their rights and decreeing that henceforth they were to be honored as barber surgeons and were to be accorded the title of "Mister." The followers of this group, now the acknowledged surgeons of the British Empire, evidence a pride in this ancient charter, especially in the title of Mister, which still almost always appears on their plates and their professional stationery instead of the conventional M.D.

—*Atkinson*

New Books

Books Received.—The following books have been received by the Editor; they will be reviewed critically as space and facilities permit. Omission of more extended review, however, is not to be taken as criticism of the merit of the book.

Current Therapy, 1956. Edited by Howard F. Conn. Philadelphia: The W. B. Saunders Company, 1956. Pp. 632. *Reviewed in this issue.*

The Doctor's Legacy. Edited by Laurence Farmer. New York: Harper & Brothers, Publishers, 1955. Pp. 267.

Sachs Essays. By Ernest Sachs. Hamden, Connecticut: The Shoe String Press, 1955. Pp. 118, with frontispiece (portrait of author).

Magic, Myth and Medicine. By D. T. Atkinson. Cleveland and New York: The World Publishing Company, 1956. Pp. 319. *Reviewed in this issue.*

Disease of the Chest. By E. Corwin Hinshaw. Philadelphia: The W. B. Saunders Company, 1956. Pp. 727, with 288 illustrations. *Reviewed in this issue.*

Clinical Disorders of Hydration and Acid-Base Equilibrium. By Lewis G. Welt. Boston: Little, Brown & Company, 1955. Pp. 262, with 11 illustrations.

Clinical Laboratory Diagnosis. By Samuel E. Levinson and Robert P. MacFate. Philadelphia: Lea & Febiger, 1956. Pp. 1216, with 244 illustrations and 13 plates, 11 in color. 5th ed. *Reviewed in this issue.*

The Cervical Syndrome. By Ruth Jackson. Springfield, Ill.: Charles C Thomas, Publisher, 1956. Pp. 130.

Blood Volume Determinations in Surgical Practice. By Olla Wiklander. Acta Chirurgica Scandinavisa Supplementum 208. Stockholm: Acta Chirurgica, 1956. Pp. 136, with 10 illustrations and 37 tables.

Les Grandes Activitès du Lobe Temporal (The Principal Functions of the Temporal Lobe). Edited by T. Alajouarrine. Paris: Masson et Cie, 1955. Pp. 297. *Reviewed in this issue.*

Handbook of Physical Therapy. By Robert Shestack. New York: Springer Publishing Company, Inc., 1956. Pp. 212.

Chirurgie des Glandes Salivaires (Surgery of the Salivary Glands). By Henri Redon. Paris: Masson et Cie, 1955. Pp. 282. *Reviewed in this issue.*

Scalpel: Men Who Made Surgery. By Agatha Young. New York: Random House, 1956. Pp. 311. Illustrated. *Reviewed in this issue.*

Christopher's Textbook of Surgery. Edited by Loyal Davis. Philadelphia: The W. B. Saunders Company, 1956. Pp. 1184, with 1359 illustrations. *Reviewed in this issue.*

Les Thromboses de la Carotide Interne et de Ses Branches (Thromboses of the Internal Carotid and Its Branches). By J. Paillas and L. Christophe. Paris: Masson et Cie, 1955. Pp. 108.

Diagnosis and Treatment of Vascular Disorders. By Saul S. Samuels. Baltimore: The Williams and Wilkins Company, 1956. Pp. 621. *Reviewed in this issue.*

Clinical Disorders of Hydration and Acid-Base Equilibrium. By Louis G. Welt. Boston: Little, Brown & Company, 1955. Pp. 262, with 11 illustrations. *Reviewed in this issue.*

Fractures of the Facial Skeleton. By N. L. Rowe and H. C. Killey. Baltimore: The Williams and Wilkins Company, 1955.

Les Traumatismes Cranio-Cerebraux Fermes Recents (Recent Closed Cranial and Cerebral Injuries). By L. Mamsuy and J. LeCuire. Paris: Masson et Cie, 1955. Pp. 122.

Catalog of French Medical and Surgical Films. Edited by Philippe Detrie. Paris: Masson et Cie, 1956. *Reviewed in this issue.*

Les Grandes Activites du Lobe Temporal (The Principal Functions of the Temporal Lobe). Edited by T. Alajouarrine. Paris; Masson et Cie, 1955. Pp. 297.

This collection of 13 papers by 18 authors represents the proceedings of the 1953 "Sermaine neuro-physiologique de la Sallpertriere" which was devoted to the functions of the temporal lobe. The embryonic and the gross and microscopic anatomic aspects of the temporal lobe are first described in considerable detail, after which electrophysiologic studies, both experimental and clinical, predominate. The temporal lobe receives attention as the site of origin of many epileptic discharges. Its sensory projections in experimental animals, especially the cat, have been determined by electrophysiologic technics. The connections of the temporal lobe with the hypothalamus and the consequent influence of the lobe on vegetative functions are considered in some detail. In another section its connections with the reticular system are taken up, and the reticular system itself is given considerable attention.

The areas of auditory perception and the language functions of the temporal lobe are given the space that these well-known functions deserve. The treatment of language and speech function includes studies on phonetics, the effect of cortical stimulation, audiometric studies and electroencephalographic studies.

The somesthetic functions of the temporal lobe and its role in the control of position and movement are considered in relation to these functions of the nervous system as a whole.

This series of monographs on the temporal lobe will interest the neuroanatomist and the physiologist and should be read by all concerned with the study of cerebral function. Clinicians interested in epilepsy and aphasia will find it especially important.

HAROLD C. VORIS, M.D.

Magic, Myth and Medicine. By D. T. Atkinson. Cleveland and New York: The World Publishing Company, 1956. Pp. 319.

A recent variation on an old theme, the struggle of medical and surgical science out of the bogs of superstition and prejudice, this book, and its author as well, faced a real challenge in the necessity to avoid the too familiar and the trite. The challenge has been met, not by avoiding repetition, which is inevitable in any historical work, but by the inclusion of a number of interesting sidelights on the life and times of the famous surgeons concerned. More than one benefactor of mankind, it is shown, died considering himself a failure; yet upon the devoted work and meticulous research of many such men depended, to an undeniable extent, the great successes of their professional descendants and even some of their contemporaries. It is pointed out, for instance, that although there is no question of Harvey's preeminence in that epoch-making discovery, the circulation of the blood, there is no lack of evidence that the studies and speculations of other workers, including Galen, Realdus Columbus, Michael Servetus and Fabricius, "had much to do with putting Harvey on the right track." There is no discredit to Harvey in this fact, since no man works alone in the scientific world; and it is pleasant to see a degree of recognition given to the kind and sincere and persevering labor which, although it may never reach full fruition, nevertheless bears its own part in the fruition to come.

Principally, of course, Dr. Atkinson's emphasis is placed on his major theme, the difficult struggle between intellect and ignorance; the battle with that sort of ingrained stupidity against which "even the gods fight in vain." The story, as always, makes stimulating reading, and nostalgic reading as well, calling the seasoned surgeon back to the thrilled attention with which, in his youth, he encounters the giants of healing for the first time. We are always in some danger of forgetting the past and the debt we owe thereto, and those who remind us deserve our gratitude.

M. T.

Catalog of French Medical and Surgical Films. Edited by Philippe Detrie. Paris: Masson & Cie, 1956.

This catalog, published in French, lists a total of 642 medical and surgical films that have been produced in France. In addition to the title of each picture and certain technical information, the author has included a brief description of the film's content and a note as to its availability. The author and subject indexes at the back of the book are most helpful.

A short article on the status of medical movies in France is included. According to the author, a list of medical films is available in France.

Catalogs of this type are bound to stimulate more widespread use of films in medical schools and in postgraduate medical education. This publication will be most useful to physicians and medical educators in France and possibly elsewhere in Europe. The difficulties of shipping films in and out of other countries limits its usefulness in areas other than those mentioned.

RALPH P. CREER

Current Therapy, 1956. Edited by Howard F. Conn. Philadelphia: The W. B. Saunders Company, 1956. Pp. 632.

Subtitled "Latest Approved Methods of Treatment for the Practicing Physician," this volume has been compiled by twelve consulting editors in addition to the chief editor, Dr. Conn. It is the eighth addition to an annual series that has met with eager acceptance all over the world.

There are more than two hundred and eighty contributors—an impressive list. The work is necessarily highly departmentalized; there are sixteen main sections, within each of which are several authors' contributions on the subject of diseases that come under the main topic. Section 1 deals with the infectious diseases; Section 2, diseases of the respiratory system; Section 3, diseases of the cardiovascular system; Section 4, diseases of the blood and spleen; Section 5, diseases of the digestive system; Section 6, disorders of metabolism and nutrition; Section 7, endocrine diseases; Section 8, diseases of the urogenital tract; Section 9, venereal diseases; Section 10, allergy; Section 11, diseases of the skin; Section 12, diseases of the nervous system; Section 13, disorders of the locomotor system; Section 14, obstetric and gynecologic conditions, and Section 15, diseases due to physical and chemical agents. Section 16 consists entirely of appendices and indexes.

The book is not illustrated, but tabular material is used when indicated. Each article on a special disease is written briefly but comprehensively, with practical down-to-earth suggestions as to treatment and general handling. Despite its size, the volume has much of the nature of a handbook; certainly it supplies a ready source of reference in any emergency. Not only the physician and the surgeon but the intelligent layman can find in these pages a great deal of highly significant knowledge; in some instances, e.g., in the section on poisoning, knowledge that could save lives.

Members of the medical profession in general will welcome the appearance of the 1956 edition of a work that is fast establishing itself as a classic.

M. T.

Chirurgie des Glandes Salivaires (Surgery of the Salivary Glands). By Henri Redon. Paris: Masson et Cie, 1955. Pp. 282. Illustrated.

This monograph is devoted to surgical treatment of the salivary glands. Appended are a comprehensive bibliography and an adequate index. The author can be justifiably proud of this book; it is well written, beautifully illustrated and pleasingly bound. Many of the illustrations are histopathologic and are very good and well chosen.

The five sections are devoted to the following subjects:

1. Traumatisms of the parotid region and their sequelae
2. Tumors of the parotid gland
3. Enlargement of the parotid gland due to inflammations and dystrophies
4. Pathologic conditions of the submaxillary glands
5. Pathologic conditions of the accessory salivary glands.

For those who read French, this is an uncommonly useful addition to their libraries. It is much more instructive in the field of pathologic change in the salivary glands than it is with regard to therapy of these lesions.

It requires a great experience to assemble and organize material for such a monograph as this, and the author deserves great praise for his ability to present his material so acceptably.

RAYMOND W. MCNEALY, M.D.

Christopher's Textbook of Surgery. Edited by Loyal Davis. Philadelphia: The W. B. Saunders Company, 1956. Pp. 1484, with 1359 illustrations.

In the twenty years since the printing of the first edition of this text, great strides have been made in the field of surgery. Today no single person can qualify as a specialist in all aspects of medicine. The editor was judicious in selecting eighty-seven contributors for this tome. Each one is an authority in his field, yet each has fulfilled the prerequisite of good teaching, which is to present the basic aspects of surgery and to stimulate further study.

Excellent reading references are appended to each section. Chapter XVII, *The Heart and Pericardium,* is presented in a concise manner.

The book is voluminously illustrated and is printed on good paper stock. It can be recommended as a good standard textbook on surgery.

PHILIP THOREK, M.D.

Diagnosis and Treatment of Vascular Disorders *(Angiology).* By Saul S. Samuels. Baltimore: The Williams and Wilkins Company, 1956. Pp. 621.

This book is edited by Doctor Saul S. Samuels, and there are seventeen other contributors. It is directed to the diagnosis and treatment of vascular disorders. In recent years angiology has grown into an intriguing specialty. With Harvey's discovery of the circulation of the blood and his quantitative and mathematical demonstration, a chain reaction of investigations was set off in the field of angiology which has culminated in observations and applications of what is now regarded as the scientific diagnosis and treatment of vascular disorders.

This volume is a comprehensive exposition of the investigations and experiences of a large number of scientists who have devoted much time to this particular subject.

The editor has arranged his material in an excellent manner, and each subject is treated exhaustively by a well-qualified contributor. The volume is not one to be read like an ordinary textbook; it is truly an encyclopedia of vascular disorders, to be referred to when in doubt about the diagnosis or treatment of a vascular disorder. At the end of each chapter there is an adequate bibliographic list.

Authors and editors who find the energy and have the ability to present the profession with volumes like this are deserving of great praise from their fellow practitioners.

RAYMOND W. MCNEALY, M.D.

Clinical Laboratory Diagnosis. By Samuel E. Levinson and Robert O. MacFate. Philadelphia: Lea & Febiger, 1956. 5th ed. Pp. 1246, with 244 illustrations, 13 plates (11 in color) and 142 tables.

It is now nineteen years that this standard text on clinical laboratory diagnosis was first published. Every new edition had to keep abreast with changing methods and new discoveries in laboratory medicine. The new fifth edition, compared with the older editions, is almost an entirely new volume.

The authors have undertaken the difficult task of writing a book that should be simultaneously a textbook for students, a guide for laboratory technicians and a source of information for the physician interested in laboratory medicine.

The popularity of the book proves that they have been successful. The completely new chapter on hematology shows how, in short, precise form, difficult subjects can be clarified to the beginner. At the same time, the discussion is at a level that is interesting and informative to the experienced worker.

All in all, this reviewer considers Clinical Laboratory Diagnosis a "must" in the library of every pathologist, and of anyone interested in laboratory medicine.

WERNER F. EISENSTAEDT, M.D.

Disease of the Chest. By H. Corwin Hinshaw and L. Henry Garland. Philadelphia. The W. B. Saunders Company, 1956. Pp. 727, *with 288 illustrations.*

This textbook on diseases of the chest was written, appropriately, by an internist and a radiologist. Both authors have had considerable experience in practice, teaching and clinical research and have written in a manner displaying their authoritative knowledge of thoracic diseases.

The text is written in a clear and simple manner, with adequate illustrations and an up-to-date bibliography. Many diagnostic and therapeutic advances have been made in the field of thoracic disorders. This textbook very adequately covers this important branch of medicine and is highly recommended to both the medical practitioner and the student.

MURRAY FRANKLIN, M.D.

Clinical Disorders of Hydration and Acid-Base Equilibrium. By Louis G. Welt. Boston: Little, Brown & Company, 1955. Pp. 262, with 11 illustrations.

In the preface to this monograph the author states that, in the consideration of abnormal clinical states of water and electrolyte balance, a constant reference to physiologic homeostatic mechanisms will lead to a better understanding of diagnostic and therapeutic measures.

He attempts to accomplish this, with some measure of success, by discussing the various phases of water and electrolyte balance in both their basic physiopathologic and their clinical aspects. The style is simple and clear, although more illustrations could have been utilized.

References are numerous and fairly comprehensive.

One important new aspect of mineral metabolism, namely aldosterone, is not mentioned or discussed. Nevertheless, this monograph is of considerable value to the practitioner and student in the understanding of electrolyte and water disturbances.

MURRAY FRANKLIN, M.D.

Scalpel: Men Who Made Surgery. By Agatha Young. New York: Random House, 1956. Pp. 311. Illustrated.

Here is a truly delightful book, dealing in the most intimately satisfying manner with the lives and achievements of Vesalius, Pare, Lister, Harvey, Hunter, MacDowell, Halsted, Cushing and other famous exponents of surgery. It is based on the author's wide researches in many medical libraries, including those of the New York Academy of Medicine and the Royal College of Surgeons in London. She has also visited both ancient and modern medical centers, including the University of Padua in Italy. It is obvious that throughout the time she spent in gathering material for the book she was never without a consuming interest in the subject, a shrewd eye for the unusual and arresting and a sensitive, perceptive—one might almost say intuitive—understanding of the surgeon's own attitude toward his work.

The result is a treasure-house of authenticated stories ranging from the hilarious to the heart-breaking. The tale of John Hunter's relentless pursuit of the unfortunate Irish giant whose skeleton he was determined to have for his museum will never be forgotten by anyone who reads it; one is torn between laughter and consternation, for Hunter, with his customery forthrightness, had apprised the luckless victim of his intention. An excellent engraving of the skeleton, seven feet seven inches in height and standing for contrast beside the tiny skeleton of a dwarf in the Hunterian Museum, affords visual proof of Hunter's resolution.

Equally stirring, in these comparatively enlightened days, are the detailed accounts of the obstacles, chiefly superstitious, over which surgery had to clamber for freedom, too often at the cost of life or reason. Although most of these are basically familiar to the surgeon who takes time to interest himself in the history of his profession, it is astonishing with what verve and immediacy they are presented. It is as though the author herself had been an eye-witness at the surgeon's elbow, even when she deals with ancient and medieval settings and protagonists. Such modern Titans as Halsted and Cushing, about whose lives more detail is available, are presented with a verisimilitude that is almost startling. The author's gift for character analysis is of a quality not met with every day.

Equal interest and pleasure attaches to the illustrations, which are not of the routine kind. Whenever a portrait of the surgeon was available, the author included it; but she also included woodcuts, etchings, engravings and paintings of apposite events and appurtenances. On one page appears the elegant contemplative skeleton from Vesalius' De Humani Corporis Fabrica, his ankles crossed and his cheek resting on his hand; below it, throwing Vesalius' artistic skill into magnificent contrast, appears a crude pre-Vesalian skeleton by some unknown draughtsman. The latter skeleton, although he wears a cheerful smile, has little else to suggest that he is human. It was an inspiration to combine the two. The whole difference between civilization and barbarism is there.

As if the authenticity, the care in selection of detail and the realistic presentation were not enough, the author is gifted also with a winning style. There is not a dull line in the book from beginning to end. It is that genuine *rara avis* that comes out occasionally, a book that can be recommended absolutely without reservation, to the lay public as well as to the professional. Few novels nowadays, though presumably written to entertain, are half as entertaining as this factual account, and few books on surgical history are one-tenth as delightful to read.

M. T.

Abstracts from Current Literature

Cardiac Arrest. Erwin, J. Y., J.M.A. Alabama 25:133, 1955.

A brief review of the current literature stressed the importance of certain clinical and statistical data. Although it is impossible to predict the patient in whom this condition may develop, certain factors are common to all. Careful attention to all details and close *cooperation of anesthetist and surgeon can be* of the utmost importance in preventing this catastrophe.

The number of deaths due to cardiac arrest has steadily increased 1:5000 in 1915 to 1:600 in 1952.

The foremost theory used to explain this increase is that the use of a multiplicity of drugs before, during and immediately after an operation makes physiologic stability difficult to maintain. A change in the types of *surgical procedures employed is suggested* as partly responsible. Bronchoscopic and esophagoscopic procedures, cardiac catheterization, and the taking of angiograms are all frequent nowadays; also, the scope and duration of operations have widened greatly.

Predisposing physiologic or pharmacologic causes are listed as follows:

1. Myocardial deficiencies
2. Hormonal and chemical changes
3. Hypoxemia
4. Vagovagal reflexes and other nervous stimuli
5. Anemia (hemorrhage)
6. Bacteria and toxins
7. Anesthetic agents
8. Barbiturates
9. Pyrogenic and transfusion reactions
10. Avitaminosis.

The condition occurs about twice as often in the male as in the female, and most frequently in the Mediterranean and darker races. In nearly 25 per cent of cases the patients are 14 years old or younger.

In 85 per cent of all cases the arrest occurs during an operation, and, of these, 32 per cent occurred during abdominal procedures—almost twice the number occurring during thoracic procedures (exclusive of operations on the heart). Otorhinolaryngologic operations caused 7 per cent of the total number but ranked fourth as causative.

Approximately one-third of these arrests occurred during the induction of anesthesia, one-third during the operation itself and one-third during closure of the wound or in the immediate postoperative period.

Important "trigger mechanisms" were manipulation of the endotracheal tube, working around the hilus of the lung, manipulation of the vagus nerve and even vomiting.

The high incidence of cardiac arrest in children—especially if combined with a relatively *high frequency of operations on the* ear, nose, and throat may well give pause to both surgeon and anesthetist. This is an appropriate time to make a plea for better preoperative psychotherapy and better preoperative sedation for children coming to the operating room. The sensitizing action of epinephrine released into the blood stream of a frightened child makes him susceptible to cardiac arrhythmia

Certainly the anesthetist plays an important role in the *detection of cardiac arrest,* for the alert anesthetist usually describes *some premonitory signs,* such as slight *change in blood pressure, some alteration of* the pulse, a change in respiration or some degree of cyanosis. Frequently bradycardia (40 pulsations per minute) is noted before the arrest occurs.

If the anesthetist announces that there is absence of blood pressure, peripheral pulse and apical impulse, one is justified in performing *immediate thoracotomy.* Lest *the* word thoracotomy should sound too formidable, it might be better to specify that the incision be made through the anterolateral part of the fourth left interspace. If the incision is started 1.5 to 2 cm. lateral to the sternum, the internal mammary artery is avoided. *Both* costal cartilages may be severed with the knife. An abdominal retractor *may* be inserted between the ribs and then turned. This spreads the ribs to allow entrance of the surgeon's hand and [illegible] the thorax and keeps pressure off until a rib-spreader can be obtai[illegible].

generally agreed that the chest must be opened and massage of the quiet heart started within four minutes (preferably three) if any degree of permanently successful resuscitation is to be obtained. Maintenance of an adequate airway is essential and is best accomplished by means of an endotracheal tube. A tight fitting anesthetic mask and an oropharyngeal airway, however, will suffice. Positive pressure should be given by the anesthetist.

More detailed explanation of entrance into the chest may be found in a number of the articles in the appended bibliography. The technic is described only briefly here in order to emphasize the point that only two instruments are needed, a knife and something to separate the ribs until further technical and mechanical aid can be obtained.

It is generally agreed that needling of the heart prior to thoracotomy and any means of massage other than transthoracic are of no value. The status of drugs injected into the heart is still debatable. Most of the drugs used are not without some danger. Epinephrine may sensitize to further arrhythmia. A case of arrest has been attributed to intracardiac injection of 200 mg. of procaine amide. Gerbode has expressed the opinion that any materials used will reach the coronary circulation better if injected into the right side of the heart and allowed to pass through the pulmonary system.

Other prophylactic measures to be stressed are as follows:

1. Effective and careful preoperative management.
2. Careful selection of anesthetic agent (caution is urged in the use of sodium pentothal and nitrous oxide).
3. Prophylaxis and treatment of all disturbances of cardiac rhythm.
4. Avoidance of too deep anesthesia.
5. Use of local anesthetics by anesthetist or surgeon to reduce reflex irritability.
6. Prevention of pyrogenic or transfusion reactions.
7. Adequate pulmonary ventilation.
8. Adequate blood volume. (Factors 7 and 8 may be interpreted as meaning that a sufficient amount of oxygen is passed through unobstructed air passages, both artificial and natural, to reach a blood stream in which the red cells are qualitatively and quantitatively adequate).
9. Avoidance of haste. (This factor has been emphasized by Blades. Briefly, when the condition of a patient becomes alarming, the surgeon should stop the procedure, consult with the anesthetist, find the cause of the trouble and correct it. Such a course is better than merely attempting to finish the operation as quickly as possible, i.e., to "get the patient off the table.")
10. Close liaison with anesthetist. (The anesthetist who can give brief, accurate reports at periodic intervals concerning the patient's progress is invaluable. Bowers advocated a meeting of surgeon and anesthetist on the day prior to every elective operation to discuss the pending procedures. In his opinion this has done a great deal to decrease the number of cardiac arrests among his patients.)

WILLIAM E. NORTH, M.D.

Les tumeurs masculinisantes de l'ovaire. Etude critique et statistique des 210 cas signalés dans la littérature mondiale (Masculinizing Tumors of the Ovary. Critical and Statistical Study of 210 Cases Reported in the World Literature). Brocq, P.; Rouvillois, C., and Mathet, P., Presse Méd. 86:1782, 1955.

Masculinizing tumors of the ovary are uncommon. Clinically and anatomopathologically they are divided into two groups: arrhenoblastomas (the more frequent), and the lipoid-cell virilizing tumors.

Usually the growth is unilateral, developing during the phase of ovarian activity. Only 1 case has been reported in which it appeared before puberty, and in 4 cases only has it appeared after the menopause. Thirty-seven per cent of the patients were below the age of 35.

Two genetic problems interest students of these tumors: (a) there seems to be a hereditary link in certain cases, and (b) there does not seem to be any association between pseudohermaphroditism and the appearance of these neoplasms.

Clinical signs are quite pathognomonic. Hormonal dosages may be of diagnostic help, and the value of urinary 17-ketosteroid dosages is underlined. Estimations taken from 21 patients with ovarian masculinizing tumors have shown high levels in two-thirds of the cases. In addition to the evaluation of total 17-ketosteroids, fractionated readings may help in diagnosing the origin of the hormonal imbalance. Thus, β-steroids point to an exclusively adrenal pathologic condition, while α-steroids would indicate a testicular and/or adrenocortical origin. Chromatographic study may also supply valuable information.

Masculinizing tumors of the ovary present a clinical and anatomopathologic condition that must be considered an entity. Although the clinical picture is clear, there is disagreement and confusion as regards the histologic aspect. The different possibilities and theories are reviewed.

The main practical problem is the evolution of these tumors and the type of treatment they require. Removal of the growth is followed by a regression of the masculinizing symptoms, except for the husky voice and the hypertrophy of the clitoris. The menstrual cycle is resumed, and pregnancy may become possible. Of the 210 patients, 60 had had a total of 150 pregnancies before any signs of the neoplasm appeared, and after removal of the tumor 39 patients had a total of 47 pregnancies.

If this course appears to be favorable, however, complications are not rare, and recurrences are to be feared. Of 158 patients with arrhenoblastomas, some of whom were followed up for more than twenty years, 32 died (a mortality rate of 21 per cent). Of 46 patients with lipoid-cell virilizing tumors, 5 died (a mortality rate of 10 per cent). Therefore, masculinizing tumors of the ovary are potentially malignant, and this fact should be taken into consideration in choosing the method of treatment.

The treatment is surgical in every case: unilateral ovariectomy for the young woman, to conserve the reproductive possibility; bilateral ovariectomy with total hysterectomy in older or parous patients. The cold logic of statistics versus the warm aspect of human relations is the problem that the surgeon must weigh in each case.

S. A. GUEUKDJIAN, M.D.

Spigelian Hernia. Isaacson, N. H., M. Ann. Dist. Columbia 25:23, 1956.

Spigelian or spontaneous lateral ventral hernia occurs infrequently and is even more rarely recognized clinically.

The most important etiologic factor would appear to be the existence of slitlike defects in the transversalis aponeurosis, along the lateral margin of the rectus muscle. These defects are present in 45 per cent of normal persons and are probably related to the lateral perforating branches of the inferior epigastric artery. General factors, such as muscle wasting, childbearing, obesity and chronic cough, are common contributory causes.

The hernial orifice may be placed anywhere along the semilunar line. The most usual position is at the outer edge of the rectus muscle, where the posterior sheath forms the fold of Douglas

The symptoms of a small hernia are often obscure and the diagnosis difficult. This is true especially of a hernia that does not perforate the abdominal wall. The symptoms are aggravated by pressure, coughing and physical exertion. Nausea, vomiting and persistent or recurrent attacks of pain may mimic any one of a variety of gastrointestinal, urinary, renal or pelvic disorders.

Spigelian hernia is easily cured by operation. The sac should be isolated and excised and the flaps of fascia and peritoneum overlapped for a secure suture line.

EDMUND LISSACK, M.D.

Treatment of Esophageal Hiatus Hernia. Tanner, N. C., Lancet. 2:1050, 1955.

The mere discovery of a hiatus hernia, with or without reflux, is not an indication for operation in the middle-aged or elderly. In the young, there is something to be said for repair in order to prevent loss of respiratory efficiency and safeguard against esophagitis. Medical management of the middle-aged or elderly patient should first be tried by treating obesity, advising the patient to avoid tight belts or corsets, to avoid stooping and to learn to sleep in the sitting position. A regime similar to that for peptic ulcer should be followed and reassurance given. If medical management fails or stenosis, esophageal ulceration or bleeding occurs, operation is indicated, as well as in massive hernia associated with breathlessness or cardiac embarrassment; recurrent gastric obstruction in the sac; acute emergencies, e. g., acute intestinal obstruction in the sac or ulcer perforation; association with cancer of the cardia. Operation is also indicated if there is an associated gastric, duodenal or stomal ulcer, or if there are gallstones. It is necessary to find out by roentgen and esophagoscopic study whether the esophagus is ulcerated, shortened, stenosed or fixed, and it important to measure its length and elasticity. If the patient has an active denal or stomal ulcer as well as a hi hernia and complains of been proved best to do a partial gastrectomy. In young and slender patients, repair of the hernia should be done also. If gallstones are present, cholecystectomy with repair of the hiatus hernia is necessary. If there is an active esophageal ulcer any repair must be carried out transthoracically, for it is possible to perforate the ulcer during esophageal manipulation. If stenosis is present, resection of the stricture and at least the upper half of the stomach, with an esophagogastric anastomosis, is preferred despite the theoretical disadvantage that reflux continues. Esophagitis does not recur, and the fibrotic gullet holds the stitches well. In unfit patients, reduction of gastric acidity by means of a lower partial gastrectomy of the Polya type is done, and if this does not give complete relief a course of bouginage is instituted. In the true congenitally short esophagus with mucosa of the gastric type in its lower portion, resection of the stricture and the upper half of the stomach is most satisfactory. The abdominal approach for repair of hiatus hernia is preferred, because the degree of herniation can be judged more accurately. The stomach is more likely to be present in the sac, and the true size of the hernia is easily ascertained. Diagnosis of accessory conditions is facilitated and handled.

Twenty per cent of the author's patients needed an operation on the gallbladder or the stomach, and often this was more important than the operation on the hiatus. The presence of penetrating ulceration, severe shortening or stricture, or malignant disease in the cardial region are all contraindications to abdominal repair of a hiatus hernia. A high midline or right paramedian incision is made, extended to remove the xiphoid and occasionally to incise the sternum up and into each fourth intercostal space. The left lateral hepatic ligament is divided, and an incision is made through the peritoneum and the phrenoesophageal ligament so that the hernia sac can be withdrawn from the mediastinum from the mediastinal side. Margins of the hiatus are carefully cleaned of all fatty and loose fascia and peritoneal tissue, so that, after placing the finger on the mediastinal surface of the hiatus, the surgeon can place his sutures to imbricate the right margin over the left behind or in front of the gullet. The anterior sutures should be continued upward to the fibrous part of the diaphragm. The hiatus is closed very snugly around the esophagus; then sutures are placed between the fascial tissue around the cardia and the fascia under the diaphragm, and tied. Often the lower part of the esophagus has been completely replaced above the level of the diaphragm; this, in effect, replaces the esophagus exactly where it should be. If relapse is going to occur, it usually does so within the first year. The roentgen and clinical indications of cure usually coincide.

WARREN A. YEMM, M.D.

The Billroth I and Polya Operations for Duodenal Ulcer. Golighter, J. C.; Moir, P. J., and Wrigley, J. H., Lancet 1:220, 1956.

The Billroth I resection, even when extensive, is an unsatisfactory operation for duodenal ulcer. After this operation the recurrence rate (up to 17 per cent on a three-year follow-up) is much higher than that after the Polya operation (2 per cent). Except for biliary regurgitation, the Billroth I operation is no less likely than the Polya operation to be followed by postgastrectomy symptoms not due to recurrent ulceration.

The functional condition of the patient after a Billroth I resection is slightly worse than after the Polya operation.

Sometimes the Billroth I method is not technically feasible, and if an attempt were made to enforce it routinely in all cases of duodenal ulcer the operative mortality rate might well increase.

The authors see no reason whatever for using the Billroth I resection as a primary operation for duodenal ulcer when one so excellent as the Polya operation is available. They admit, however, that for the occasional case of very severe bilious vomiting after a Polya gastrectomy for duodenal ulcer it may be justifiable to convert the anastomosis to one of the Billroth I type and accept the increased risk of recurrent ulceration in order to eliminate this incapacitating symptom.

WILLIAM E. NORTH, M.D.

Interpretation of Intravenous Cholangiogram. Wise, R. E., and O'Brien, R. J., J.A.M.A. 160:819, 1956.

Intravenous cholangiographic study is a relatively safe procedure that is indicated for examination of the patient with recurrent or new symptoms referable to the biliary tract after cholecystectomy.

More widespread use and further knowledge will lead to a more accurate evaluation of the postcholecystectomy syndrome.

EDMUND LISSACK, M.D.

A propos des syndromes multicarentiels des gastrectomies pour ulcères (On the Deficiency Syndromes Following Gastrectomy for Ulcer). Morin, M.; Graveleau, J. C., Lafon, J.; Labet, R., and Perol, R., Presse Méd. 86:1798, 1955.

The postgastrectomy deficiency syndrome may appear immediately after the operation, but as a rule it develops after a few months or years.

There is a net male predominance: 14 men as against 1 woman in the authors' series. This they explain not only by the predominance of peptic ulceration in men but also by their higher alcohol intake.

General debility — asthenia — is the most constant, early and striking symptom. Weight loss, which may be considerable is sometimes masked by edema. Anorexia and diarrhea are marked. Pain is not a habitual symptom. The teguments present atrophic changes.

Hemoglobin and blood cell counts are very low.

Metabolic disturbances are very frequent. There is a fall in the level of blood proteins. The blood sugar content may be normal or low; glycosuria may be present. In fact, many *patients in the authors' series were referred* to the hospital with the diagnosis of diabetes. Induced hyperglycemia gives readings that differ from the normal curves.

Tests of total blood cholesterol or serum lipoids and other liver function tests do not *seem to yield valuable information. In 12 of* the 15 patients investigated there was marked hepatomegaly. In 14 cases, microscopic examination of the liver showed three principal types of modifications: steatosis, cirrhosis and siderosis. Excellent color photomicrographs illustrate these conditions.

Endocrine exploration may show a fall in 17-ketosteroids.

The clinical picture is that of undernourishment.

There is no strict parallelism, but there is a frequent coincidence between the postgastrectomy deficiency syndrome and the dumping syndrome. The treatment of both conditions is, unfortunately, quite confusing.

S. A. GUEUKDJIAN, M.D.

La photographie laparoscopique (Laparoscopic Photography). Calame, A., Presse Méd. 86:1848, 1955.

Laparoscopic *investigation is becoming* more and more widespread in its use as a valuable *diagnostic procedure.* It renders possible the visual appreciation of certain intra-abdominal conditions, particularly diseases of the liver, hepatic metastases and intraperitoneal adhesions. It may thus often replace *the more major procedure, laparotomy.* Furthermore, a biopsy specimen taken through *the laparoscope will furnish important histologic* information.

The *author describes a personal method of* taking laparoscopic photographs with an *original instrument.* The main difference resides in the camera and the lighting arrangement. The camera has a "reflex vision," and the prism is of clear rather than ground glass. The main feature, however, is the lighting system, which consists of an electronic tube with a 1000-volt cold lamp emitting an extremely luminous flash. These have, for the first time, made possible instantaneous photographs taken in 1/800 of a second, and excellent pictures can be obtained not only in black and white but in color. The technical points are described in detail, and those who are interested in endoscopic photography will be well advised to refer to the original work.

Excellent laparoscopic photographs in color enrich this article. The method might easily *be used in endoscopic studies elsewhere,* such as the larynx, the stomach or the rectum.

S. A. GUEUKDJIAN, M.D.

Treatment of Choice in Hydatid Disease of the Liver. Mayner, C., Cir. Ginecol. y Urol. 9:82, 1955.

The most widely utilized treatment in the evacuation of hydatid cysts of the liver is the classis technic of marsupialization. The author states that the results obtained by this method are not always satisfactory. When it is feasible, he says, *the ideal method is partial* hepatectomy with extirpation of the cyst. The dangers of *marsupialization with subparietal* closure are emphasized, as are the poor *results that follow the use of this procedure.*

In some cases the walls of the cyst are so *thin that evacuation of the cyst may be followed* by approximation of the walls. There are *other cases in which* the cyst has become calcified and is discovered accidentally by roentgen examination. Such cysts are left alone; no surgical attempt is made to remove them.

Today, in spite of all the advances in surgery, there are many types of hydatid cyst *that present a great problem to* [illegible].

MARK K. I

Nuevo Tratiamento de Fracturas (A New Treatment of Fractures). By Jorge Garcia Leon.

A technic is described in which acrylite is used as a sleeve in the treatment of fractures. An open reduction is done, and an assistant prepares a paste of acrylite that is placed about the fracture site, both above and below, in the form of a sleeve. Great care is taken that the paste does not enter between the fragments, as it will prevent union.

Originally the author molded the paste by hand about the fracture site. This method was unsatisfactory, so the author developed a bivalved clamp in order to produce the sleeve effect without any difficulty. At the time of application the paste is of the consistency of rubber; within ten minutes it hardens completely.

This method was first used experimentally on dogs, with good results. The author has used it in the treatment of fractures and in cranioplasties and arthroplasties. The ad- tages claimed for the method are as fol- : (1) it does not interfere with osteo- sis; (2) it does not cause any necrosis the bone; (3) there is efficient fixation of the fragments, and (4) there is accelerated healing.

MARK K. NETTLES, M.D.

The Surgical Treatment of Hydrocephalus Not of Termaral Orgin: Results of One Hundred Operations. Obrador Alcolde, S., Cir. Ginec. Urol. 9:65, 1955.

Many technics have been employed in treating this condition, with almost uniformly disappointing results. In the present series of cases a few are reported in which the patient was free of symptoms. In most cases, however, the end results were discouraging.

For infantile hydrocephalus the immediate postoperative mortality rate was 25 per cent. The survivors manifested severe neurologic and mental effects which, in the majority of cases invalided them.

The adult type was studied in 23 cases, in all of which there were definite signs of intracranial hypertension. The results of surgical intervention were extremely discouraging.

Early diagnosis and treatment, plus a better understanding of the pathologic mechanisms, may produce better results in the future.

MARK K. NETTLES, M.D.

Continuous Intragastric Milk Drip in Treatment of Uncomplicated Gastric Ulcer. Doll R.; Price, A. V.; Pygott, F., and Sanderson, P. H., Lancet 1:70, 1956.

The value of continuous intragastric milk drip in the treatment of gastric ulcer has been investigated by means of a controlled trial that covered 164 inpatients in two hospitals. For 40 patients the drip consisted of 6 pints of milk per day without any added alkali; for 40 others, 40 Gm. of sodium bicarbonate was added to each 6 pints of milk, and for 2 the dose was increased to 80 and 140 Gm. respectively.

The proportion of ulcers that healed in the course of a month was identical in the two treatment groups (20/82).

The impression was that pain was relieved more rapidly with the milk drip than without it; and an alkalinized milk drip is considered a useful adjunct to the standard treatment for patients whose pain persists after rest in bed.

Patients given milk drip gained, on the average, more weight than did patients not given the drip (7 pounds as compared with 3 pounds and 8 ounces), and a slight advantage (15 ounces) was preserved two to three months after discharge.

WILLIAM E. NORTH, M.D.

Conceptos Histopatologicos Referentes al Tratiamento del Cancer Prostatico (Histopathologic Concepts of the Treatment of Prostatic Carcinoma). De la Pena, A., and De Castro, F., Mem. & Bull. Soc. Internat. de Urol. (Proceedings of the Tenth Congress of the International Society of Urology, Athens, Greece, April 10-18, 1955.)

By comparing present clinicostatistical knowledge with historical observations, one can infer that as yet there is no efficacious curative therapy available for cancer of the prostate.

There are many unresolved questions in the nosologic aspect of prostatic carcinoma. It would be indispensable, on the one hand, to make an early and unquestionable diagnosis, since the axiom *"to cure is to diagnose early and positively"* illustrates, in this instance, the most striking expression of human limitations. On the other hand, it would be ideal to arrive at a histoclinical classification based on the degree of malignancy of the different types of neoplasm, especially with regard to their capacity for growth and diffusion. Once these two aims were achieved, future statistics would probably be congruent and acceptable; they would produce data on the efficacy of the different therapeutic variants, clarifying the palliative effect of some and testing whether in fact they prolong the life of the patient with cancer.

The current histopathologic criterion attributes greater malignancy to the anaplastic type of carcinoma, either small-celled or large-celled, which manifests a greater degree of aggressiveness than do the adenocarcinoma and the malign adenoma. It must not be forgotten, however, that the adenocarcinoma can change toward the undifferentiated type during its infiltration process.

In view of the structural modifications achieved with estrogen therapy, it appears that the most sensitive neoplasm is the adenocarcinoma, the sensitivity of its anaplastic variant being nil. The response of those sensitive to estrogen, although variable in cases of that type, consists principally in regression of the inflammatory processes; a tendency toward differentiation of the neoplastic elements, and diminution of mitotic activity, the cells becoming more stable but continuing to foster a potential malignant change that will reappear at a given moment, becoming independent of the estrogenic attack.

Briefly, the following conclusions seem justified:

1. There is no sufficiently early or credible means of diagnosis that might permit the indication and performance of a guaranteed therapeutic procedure.
2. The questionable aspect of many preoperative diagnoses is revealed in the fact that biopsy and radical exeresis tests occasionally show simple inflammatory processes.
3. There are no precise histopathologic data, nor is there a systematic micromorphologic classification of the lesions that might permit an estimate of the efficacy of the various therapeutic methods now available.
4. There is no unanimous agreement as to the point of origin of cancer, though when the onset is coexistent with benign adenomyoma it appears with a certain regularity in the so-called surgical capsule, *most frequently in its caudal part.* In the face of a high incidence, this would require that nothing other than radical prostatic vesiculectomy be performed.
5. Pure malign adenomas may coexist with surgical capsules that are undamaged.
6. The lack of unity as to the histopathologic criterion seems, at present, insuperable.
7. The distinct evolution of the histologic type makes the clinical and therapeutic theories absolutely fallacious, as a result of which the majority of the statistical data are incongruous and inaccurate.
8. The various histologic forms—potentially malign adenomyomas, adenocarcinomas of the surgical capsule and anaplastic carcinomas—respond in various ways to contemporary methods of treatment.
9. The authors' own histologic observations, together with those of writers in other countries, prove that the antiandrogenic attack is still doubtful, considered purely from the aspect of the tissues.
10. The histologically much differentiated neoplasms do not permit the least therapeutic hope, even of palliation, and are extremely estrogen-resistant from their onset.
11. The adenocarcinoma in a relatively wide group respond temporarily to castration and estrogen therapy.
12. The nosologic aspects of this therapeutic method are still in confusion, and its value as an ex-jubantivus test is nil.
13. The response of the tissues to estrogen therapy is signified by (1) a tendency toward slowing up of the evolutionary process; (2) diminution of mitotic activity, and (3) volumetric cellular normodifferentiation, which is manifested in all the elements of the neoplasm.
14. Intravenous massive estrogenic therapy does not seem as efficacious as do the other forms, and it is possibly more dangerous (hepatitis, etc.).
15. Any attempt to resensitize the tissue structures once they have reached the estrogen-resistant stage is apparently useless and harmful.
16. Exeresis of the organs of androgenous substitution (adrenal glands, hypophysis, etc.), apart from being a dangerous palliative measure, has not yet passed the experimental stage. Through its results, and through subjecting the patient to an endless and costly pharmacologic slavery, such measures are going through a period of negativism.
17. Radical prostatovesicular surgical intervention, now extensively used and readily available, does not seem really efficacious.

18. It is not yet possible to perform a radical prostatectomy to prevent the evolution of a prostatic cancer in the remaining glandular elements, on account of the risks and the morbidity rate (definite incontinence and impotence).
19. All physiotherapeutic or chemotherapeutic measures that have been widely employed fail to leave any basis for a possible cure.
20. The evolutionary potentiality in each case is dependent on an equation of which the neoplastic type, the hormonal balance and the individual capacity for reaction to the various therapeutic methods are unknown quantities.
21. As long as there is a large number of cases in which a relatively favorable spontaneous evolution may be possible, all clinical deductions can prove fallacious.
22. The arbitrariness of the methods employed and the diversity of the various clinical criteria prove that the therapeutic aspects of prostatic cancer is still to be clarified.

Important Announcement For 1957!

The Tenth International Scientific Congress of the International College of Surgeons will be held at the invitation of the Mexican Government and under the Honorary Presidency of His Excellency, Don Adolfo Ruiz Cortinez, President of the Republic of Mexico, February 24-28 inclusive, 1957, at University City, Mexico, D. F. The Grand Opening Ceremony will take place at the Palace of Fine Arts, and the scientific sessions in the University buildings.

For further details address:

International College of Surgeons
1516 Lake Shore Drive
Chicago 10, Illinois

Attention: Secretary, Mexican Congress

THE JOURNAL OF THE INTERNATIONAL COLLEGE OF SURGEONS

Index, Volume XXV, January-June, 1956

By Subjects and Authors

INDEX TO ARTICLES

Abdominal and General Surgery
  January 1
  February 137
  March 271
  April 403
  May 541
  June 675
Abscess
  of anus 633
Abstracts from Current Literature
  January 134
  February 267
  March 400
  April 537
  May 669
  June 795
Abuse
  of oxytoxics in pregnancy 483
Adenocarcinoma
  of bladder 461
  of rectum 520
Alimentary tract
  duplication of 403
Anastomosis
  aortosplenic 448
Anesthesia
  steroid, in man 9
  clinical and, cerebral metabolic effect of 9
  clinical report of 13
  hibernation, artificial 271
Aneurysm
  treated with dermal grafts 171
Anomaly
  of alimentary tract 403
Anus
  abscesses and fistulas of 633
  amputation neuroma of 239
Appendectomy
  vs. hemicolectomy, for carcinoma 566
Arrest
  cardiac 299
Arterialization
  experimental, of liver 118
Artery
  "middle colic" 455
Athetosis 202

Bladder
  urinary 461
[illegible]
  granuloma of 503
Book reviews
  January
    Albertini, A.: *Histologische Geschwulstdiagnostik* 133
    Cole, Warren H: *Operative Technics in General Surgery* 131
    Holman, Emile: *New Concepts in Surgery of the Vascular System* 131
    Penman, John, and Smith, Marion C.: *Intracranial Gliomata* 132
    Rush, Leslie V.: *Atlas of Rush Pin Technics* 132
    Wachsmuth, T. von Lanz W.: *Praktische Anatomie* 133
  February
    Bateman, James E.: *The Shoulder and Environs* 265
    Blondin, Sylvain: *Surgery of the Thyroid* 263
    Collected Papers of the Mayo Foundation 265
    Hryntschak, Theodor: *Suprapubic Prostatectomy, with Primary Closure of the Bladder by an Original Method* 263
    Lewin, Philip: *The Back and Its Syndrom* 264

Lowrie, Robert J.: *Gynecology Surgical Techniques* 263
Shackelford, Richard T., and Dugan, Hammond J.: *Bickham-Callander Surgery of the Alimentary Tract*.. 264
Watson-Jones, Reginald: *Fractures and Joint Injuries* 264

March
A.M.A. Scientific Exhibits, 1955.... 399
Buxton, St. J. D.: *Arthroplasty*.... 399
Cash, Joan E.: *Physiotherapy in Some Surgical Conditions*........ 397
Cobey, Milton C.: *Postural Back Pain* 398
Fabricant, Noah B.: *J.A.M.A. Clinical Abstracts of Diagnosis and Treatment*, 1955 399
Mayo, Charles W.: *Surgery of the Small and Large Intestine: A Handbook of Operative Surgery*.. 397
Williams, Robert H.: *Textbook of Endocrinology* 398

April
Barnett, A. J., and Fraser, J. R. E.: *Peripheral Vascular Disease*...... 535
Bleck, E. E., Duckworth, Nellie, and Hunter, Nancy: *Atlas of Plaster Techniques* 535
Cowdrey, E. V.: *Cancer Cells*...... 535
Craig, Paul C.: *Ophthalmology*..... 536
De Takats, G.: *Thromboembolic Disease* 534
Greisheimer, Esther M.: *Physiology and Anatomy* 534
Lam, Conrad, R.: *Henry Ford Hospital Symposium on Cardiovascular Surgery* 534
Moore, Daniel C.: *Complications of Regional Anesthesia* 536
Postell, William Dosite: *Applied Medical Bibliography* 536

May
Bakey, Louis: *The Blood-Brain Barrier, with Special Regard to the Use of Radioactive Isotopes* 663
Burton, Alan C., and Edholm, Otto G.: *Man in a Cold Environment*.. 664
Congress of Neurological Surgeons, 1954: *Clinical Neurosurgery*..... 665
Flippin, Harrison, F., and Eisenberg, George M.: *Antimicrobial Therapy in Medical Practice*............ 667
Hackett, George Stuart: *Joint Ligament Relaxation Treated by Fibro-Osseous Proliferation* 667
Herbut, Peter E.: *Pathology*....... 664
Lesnik, Milton J., and Anderson, Bernice E.: *Nursing Practice and the Law* 666
Lown, Bernard, and Levine, Samuel L.: *Current Concepts in Digitalis Therapy* 665
McGregor, A. L.: *Surgery of the Sympathetic Nervous System*..... 663
Stein, I. R.; Stein, R. O., and Beller, M. L.: *Living Bone in Health and Disease* 666
U. S. Naval School, Bethesda, Maryland: *Color Atlas of Pathology*... 663
Wynder, Ernest L.: *The Biologic Effects of Tobacco*............... 663

June
Alajouarrine, T.: Les Grandes Activites du Lobe Temporal (*The Principal Functions of the Temporal Lobe*) 791
Atkinson, D. T.: *Magic, Myth and Medicine* 791
Conn, Howard F.: *Current Therapy* 792
Davis, Loyal: *Christopher's Textbook of Surgery* 792
Detrie, Philippe: *Catalog of French Surgical and Medical Films*...... 791
Hinshaw, H. Corwin, and Garland, L. Henry: *Disease of the Chest*...... 793
Levinson, Samuel E., and MacFate, Robert O.: *Clinical Laboratory Diagnosis* 793
Redon, Henri: Chirurgie des Glandes Salivaires (*Surgery of the Salivary Glands*) 792
Samuels, Saul S.: *Diagnosis and Treatment of Vascular Disorders (Angiology)* 793
Welt, Louis G.: *Clinical Disorders of Hydration and Acid-Base Equilibrium* 793
Young, Agatha: *Scalpel: Men Who Made Surgery* 794

Bracing
for cerebral spastic paralysis........ 35

Calculi
small renal 571

Carcinoma
  of appendix 566
  of cervix 340
  of bladder 461
  of kidney 117
  of larynx 603
  of prostate 471
  of rectum 625
  of sigmoid 510
Cardiovascular Surgery
  January 18
  February 157
  March 299
  April 448
Cholecystectomy
  technic 442
Chorea
  treated by stereoencephalotomy 202
Classification
  of testicular tumors 187
Colon
  colposcopic examination of 104
  sarcoma of 379
  use as substitute for stomach 558
Colposcopy
  in diagnosis 104
Complications
  of gentourinary surgery 585
  of obstetric and gynecologic surgery .. 585
  of pelvic surgery 755
Condylectomy
  for metatarsalgia 220
Cornea
  dermoid of 500
Correction
  of wrinkles 613, 620

Defect
  septal, in canine heart 30
Denervation
  of hip joint 595
Dermatitis
  chromoparasitic verrucose 545
Dermoid
  of cornea and sclera 500
Diagnosis
  colposcopic 104
  of intestinal obstruction 137
  of ocular muscle disturbances 590
  with aid of scout film 137
Dilatation
  cystic, of common duct 430
Disease
  Graves' 383
  Letterer-Siwe's 503
Diverticula
  of esophagus 127
Duct
  common, cystic dilatation of 430
Duodenum
  ulcer of 698
Duplication
  of alimentary tract 403

Ear
  plastic reconstruction of 227
Editorials
  January
    Advantages of One-Stage Resection of Esophageal Diverticula 127
  February
    John Arderne, Father of English Surgery 247
  March
    On Relaxation 393
  April
    The Position of the Specialist in the International College of Surgeons 530
  May
    Infertility Among the Ancients 656
  June
    Perception and Prophecy 786
    Timely Reflections 788
Electrocoagulation
  of frontal lobes 475
Embolism
  air, mechanisms of causation 675
Episiorrhaphy 653
Esophagus
  diverticula of 127
Exposure
  of abdomen, for suspected appendicitis 148
Eye
  in focal infections 766
  muscular disturbances of 590
  orthoptic treatment of 65
  tumor of 500
  with Ridley acrylic lens 72

Feet
  flat, in children 77
Fibroma
  of lung 241
Film, scout
  value of 137

[illegible]
  [illegible] 633
  [illegible] 513
[illegible]
  [illegible] 318
  [illegible] 85

G[illegible]
  [illegible] 142
  [illegible]
  [illegible] 142
  [illegible]
  [illegible], in 200 cases 421
  [illegible] 409
  [illegible] after 558

  [illegible] hernia repair 153
  [illegible]
  [illegible] 85
  [illegible] 171
  [illegible] 227
  [illegible]
  [illegible] 117
  [illegible] 179
  [illegible] 310
  [illegible] 461
  [illegible] 571
  [illegible] 735

H[illegible]
  [illegible] 366
[illegible]
  [illegible] carcinoma 566
[illegible]
  [illegible] 145
  [illegible] 755
  [illegible] 142
[illegible]
  [illegible] pregnant uterus 208
  [illegible] repair of 153
[illegible]
  [illegible] 271
[illegible]
  [illegible] 595
[illegible]
  [illegible] primary 735
  [illegible] 571
[illegible]
  [illegible] 637

I[illegible]
  [illegible] 782
  [illegible] 487
[illegible]
  [illegible] 96

Infertility
  among the ancients 656
Intussusception
  sigmoidorectal 510

Jejunostomy 278
Jejunum
  leiomyosarcoma of 254
Joint
  hip, denervation of 595

Kidney
  carcinoma of 117
  with small calculi 571

Larynx
  carcinoma of 603
Leiomyoma
  of lung 241
Leiomyosarcoma
  of jejunum 254
Lens
  Ridley acrylic 72
Lobes, frontal
  electrocoagulation of 475
Lungs
  pedunculated fibroma and leiomyoma of 241

Management
  of anal incontinence 782
  of dilated common duct 430
  of giant hemangioma 366
  of leg ulcers 718
  of stress incontinence 487
Manipulation
  remote, canine renal response to 744
Meniscus
  in otoplasty 227
Metastasis
  to scalp 520
  to ureters and bladder 117
Metatarsalgia
  with condylectomy 220
Metrorrhagia 642

Nervous system, central
  lesions of 751
Neurologic Surgery
  January 35
  February 202
  March 327
  April 475
  June 751
Nose
  tumors of 777

Obstetric and Gynecologic Surgery
  January 40
  February 208
  March 340
  April 483
  May 585
  June 755
Obstruction, intestinal
  diagnosis of 137
  in Japan 541
Occlusion
  coronary 299
Operation
  Wertheim's, for carcinoma of cervix 340
Ophthalmologic Surgery
  January 65
  April 500
  May 590
  June 766
Otoplasty
  with homogenous knee meniscus 227
Orthopedic Surgery
  January 77
  February 220
  March 348
  April 503
  May 595
Orthoptics
  logical use of 65
Otoplasty
  with homogenous knee meniscus 227
Otorhinolaryngologic Surgery
  January 65
  February 212
  March 356
  May 603
  June 772
Otosclerosis
  mobilization of stapes for 212
  surgical treatment of 772
Oxygen
  subcutaneous, for arterial disease 18
Oxytoxics
  use and abuse in pregnancy 483

Pain
  of anorectal origin 524
  relief of 475
Palate, cleft 356
Papilloma
  villous 374
Paralysis
  cerebral spastic 35
  periodic 383
Peritonitis
  tuberculous 689
Phlebectasia
  of small intestine 445
Plastic and Reconstructive Surgery
  January 91
  February 227
  March 227
  May 613
Plastics
  study and preparation of 91
Plastic surgery
  of ear 227
  of face 366, 613, 620
  in industry 96
Plate
  extra-long trochanteric 348
Plication
  for tuberculous peritonitis 689
Polyp
  adenomatous, of duodenum 562
Pregnancy
  herniation of uterus in 208
  use and abuse of oxytoxics in 483
Proctologic Surgery
  January 104
  February 239
  March 374
  April 510
  May 625
  June 782
Prevention
  of fetal wastage 53
Prostatectomy
  radical perineal 471
PVP-iodine 727

Rectum
  cancer of 625
  villous papillomas of 374
Repair
  of hernia 153
Resection
  of appendix 566
  of esophageal diverticula 127
  of gallbladder 442
  of prostate 471
  of stomach 409, 421, 558, 713
Reserpine
  in neurologic surgery 480
Resuscitation
  after cardiac arrest 299
Rhytidoplasty
  present status of 613
Rotation
  lateral, of legs of children 77

of tuberculous peritonitis 689
of varicocele 179

Tumor
of appendix 566
of bladder 461
of cervix 340
of cornea 500
of jejunum 254
of kidney 117
of larynx 603
of lung 241
of nose 777
of paranasal sinuses 777
of prostate 471
of rectum 520
of sclera 500
of sigmoid 510
of testis 187

Ulcer
duodenal 698
leg 718
peptic 289

Urinary tract
infection of 40

Uterus
pregnant, extreme herniation of...... 208

Vagotomy
for duodenal ulcer................. 698

Valve
canine aortic, approach to.......... 26

Varicocele
present conception of............... 179

Visualization
of gallbladder 1

Wastage
fetal 53

Wertheim operation
for cancer of cervix 340

Women
pelvic surgical treatment of.......... 585
stress incontinence in................ 487
urinary infection in................. 40

Wrinkles
plastic correction of............613, 620

) AUTHORS

Bailey, Hamilton 675
Baird, H. Haynes.................... 471
Barbosa, Edgard 430

Rate, Robert G. 430
Ratko, Arthur L. 777
Reams, Gerald B. 421
Reed, H. Lester 751
Reihmer, V. A. 289
Ribeiro, Eurico Branco 179
Rilling, George J. 112
Roedling, Herbert A. 18
Ronis, Bernard J. 608
Rosner, Samuel 480
Rumel, W. R. 157

Saito, Kyoshe 541
Scheer, Alan A. 212
Schuster, James L. 698
Seldin, Harry R. 766
Servello, Manfredi 448
Shelanski, Herman A.† 727
Shelanski, Morris V. 727
Silcox, Louis E. 362
Skolnik, Emanuel M. 356
Soboroff, Burton J. 603
Somervell, T. H. 713
Spaeth, Edmund B. 65
Spiegel, E. A. 202
Spire, A. J. 153
Spire, L. J. 153

---

†Deceased.

Steinger, Louis 379
Stewart, Allen T. 759
Stofer, Bert E. 566
Straith, Claire L. 96
Swanker, Wilson A. 613
Sylos, Flavio 271

Tanous, John Harrington 254
Thorek, Max 393, 530, 786
Tidrick, R. T. 409
Turpin, J. E. H.† 744

Vause Greig, G. W. 510
Vianno, João B. 366

Wang, S. K. 503
Weiss, Gerald N. 247
Wertheimer, Luiz Gustavo 595
Wickstrom, A. P. 409
Williams, John I. 461
Wilmotte, Maurice 637
Wilson, James K. 148
Wolfe, Louis 340
Wycis, M. T. 202

Zimmerman, Karl 782

---

†Deceased.

Important Announcement For 1957!

The Tenth International Scientific Congress of the International College of Surgeons will be held at the invitation of the Mexican Government and under the Honorary Presidency of His Excellency, Don Adolfo Ruiz Cortinez, President of the Republic of Mexico, February 24-28 inclusive, 1957, at University City, Mexico, D. F. The Grand Opening Ceremony will take place at the Palace of Fine Arts, and the scientific sessions in the University buildings.

For further details address:
International College of Surgeons
1516 Lake Shore Drive
Chicago 10, Illinois
Attention: Secretary, Mexican Congress